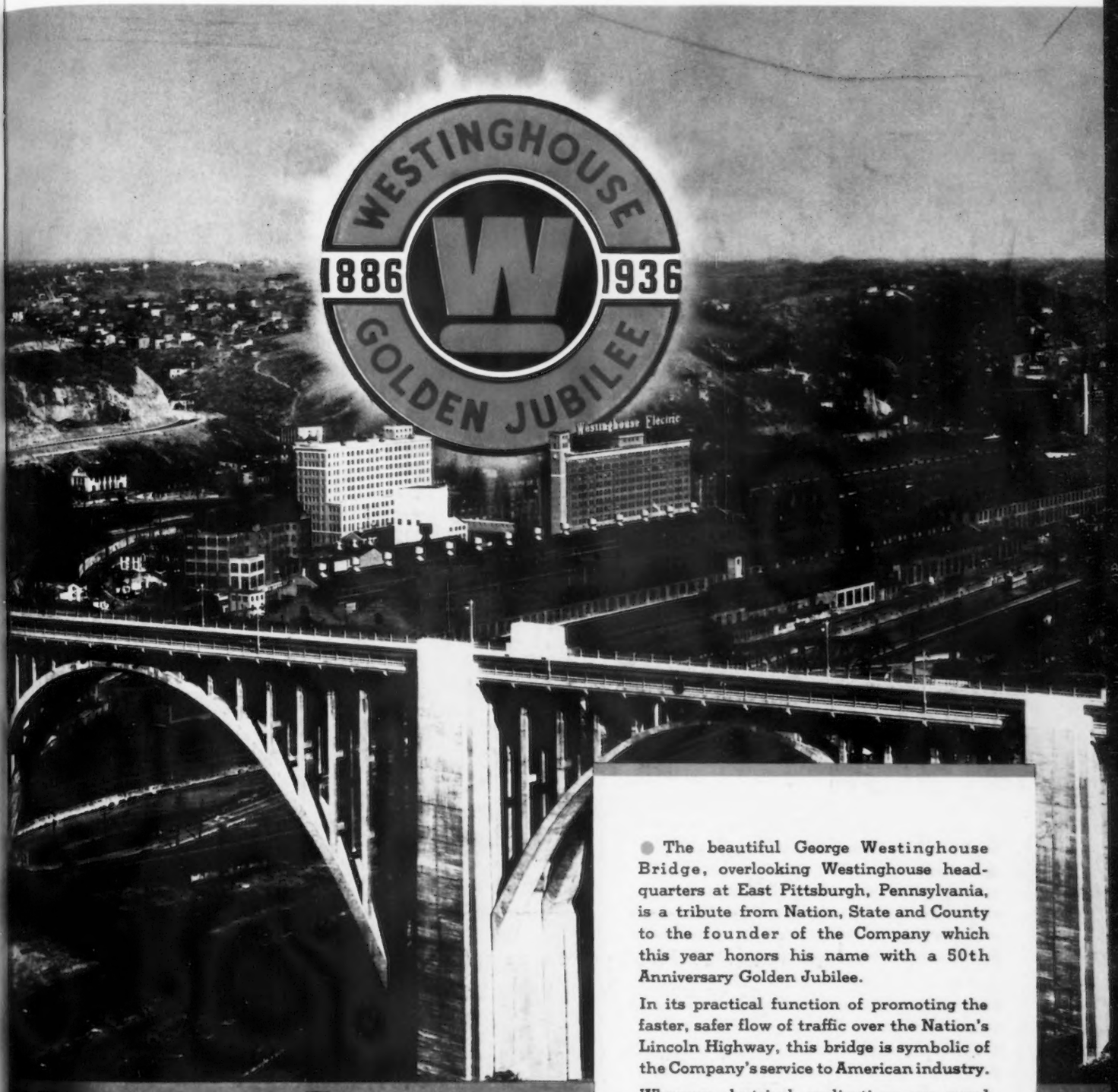
Library
JUN 25 1936

THE IRON AGE

JUNE 25, 1936



Westinghouse
ELECTRIC AND MANUFACTURING COMPANY

The beautiful George Westinghouse Bridge, overlooking Westinghouse headquarters at East Pittsburgh, Pennsylvania, is a tribute from Nation, State and County to the founder of the Company which this year honors his name with a 50th Anniversary Golden Jubilee.

In its practical function of promoting the faster, safer flow of traffic over the Nation's Lincoln Highway, this bridge is symbolic of the Company's service to American industry.

Wherever electrical applications can speed industry's flow—whenever industry's electrical problems must be *spanned* by vision and experience—the fifty-year record of the Westinghouse Electric and Manufacturing Company is unmatched. Westinghouse faces the problems of the future with a confidence born of this record.

J 99349



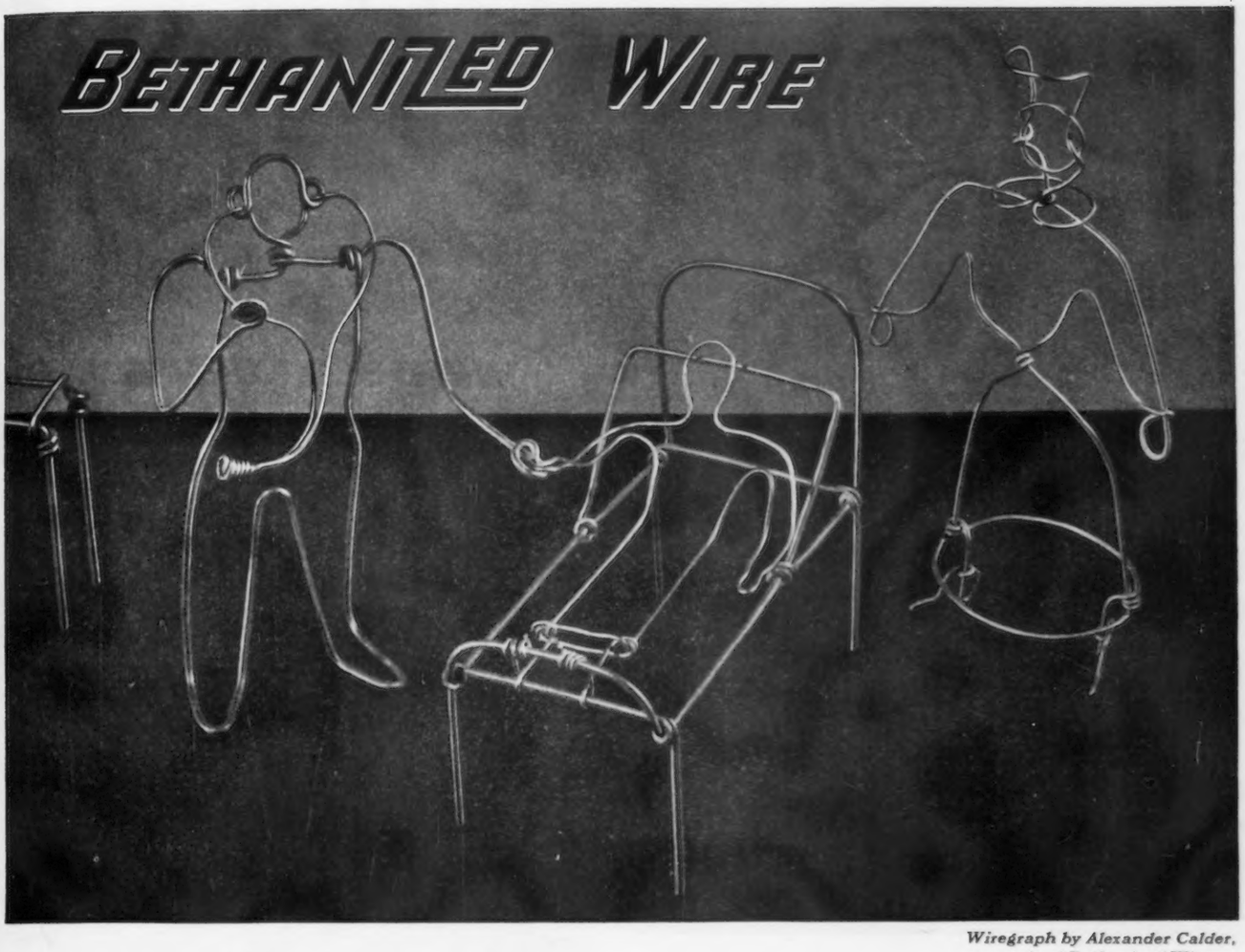
PHOTO BY HEATH STUDIOS

For half of the 50 years since "Westinghouse" was organized, that company has been one of our best customers on Chromel Resistance Wire and Ribbon, for heating-element material. This fact is symbolic of the position held by Chromel throughout the electric heating industry. . . . For useful technical data, ask for Catalog-K.I. . . .

◆

HOSKINS MANUFACTURING COMPANY . . . DETROIT, MICHIGAN

THE IRON AGE, published every Thursday by the *CHILTON CO., (INC.)*, Chestnut & 56th Sts., Philadelphia, Pa. Entered as second class matter November 8, 1932, at the Post Office at Philadelphia under Act of March 3, 1879. $6.00 a year in U. S., Canada $8.50, Foreign $12.00. Vol. 137, No. 26.



Wiregraph by Alexander Calder, made of Bethanized Wire

Better for springs of many kinds

BETHANIZED wire is now being used for springs of many kinds. Tightly adherent, heavy-weight bethanized coatings stand up to the punishment that is unavoidable in the coiling of high carbon spring wire, without flaking or scaling.

This new kind of zinc-coated wire is meeting service and manufacturing requirements for springs of every type used in beds—for box spring coils, inner-spring units, spring mattress fabrics, and the small elliptical springs used in flat spring constructions. Hospital beds with springs of bethanized wire go through steam sterilization without rusting. Tickings and mattresses of camp beds or beds exposed to dampness on sleeping porches don't get soiled with rust spots when all springs are of bethanized wire. And it's equally advantageous for furniture and cushion springs, springs for bicycle seats and many other applications.

Because of its silvery, lustrous appearance bethanized wire increases sales appeal. The bethanized coating is so tight and ductile that coating weights can be utilized that are two and three times heavier than the heaviest hot-dip galvanizing, without flaking off in coiling or knotting—or from the repeated flexing of the springs in service.

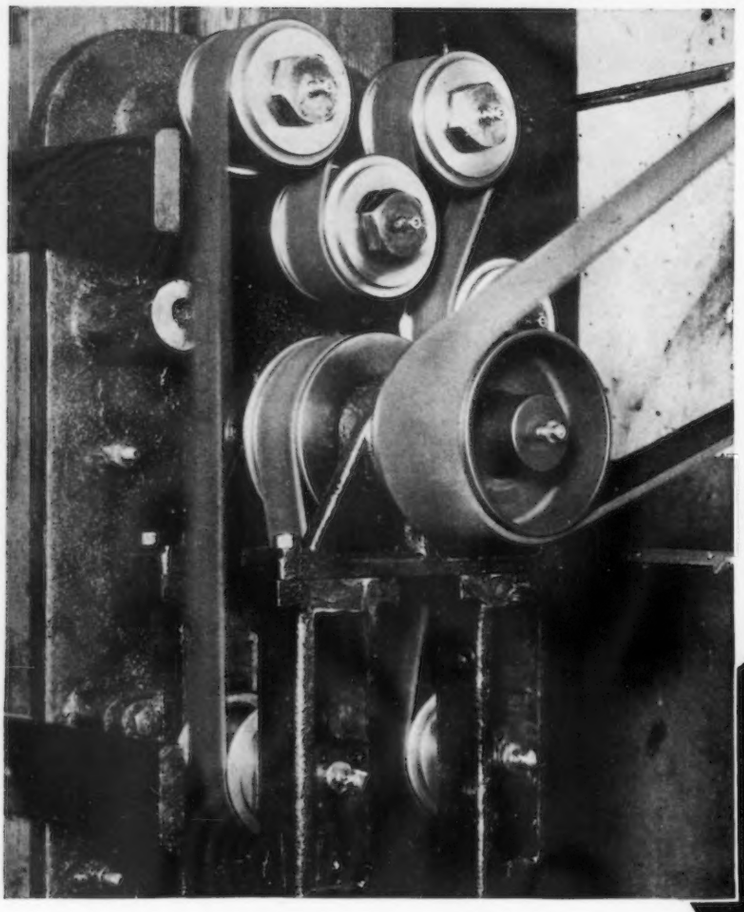
Bethanized wire is not only better serving every use to which galvanized wire has heretofore been applied, but is opening the way for new uses of galvanized wire.

BETHLEHEM STEEL COMPANY, *General Offices:* Bethlehem, Pa. *District Offices:* Albany, Atlanta, Baltimore, Boston, Bridgeport, Buffalo, Chicago, Cincinnati, Cleveland, Dallas, Detroit, Hartford, Honolulu, Houston, Indianapolis, Kansas City, Los Angeles, Milwaukee, New York, Philadelphia, Pittsburgh, Portland, Ore., Salt Lake City, San Antonio, San Francisco, St. Louis, St. Paul, Seattle, Syracuse, Washington, Wilkes-Barre, York. *Export Distributor:* Bethlehem Steel Export Corp., New York.

BETHLEHEM STEEL COMPANY

BETHLEHEM STEEL

On this TORTURE MACHINE



we get a preview of PROFITS from BELTING



Made up of several cruel drives and packing 6 years' work into 48 hours, it makes sure of the profits YOU can get from Research Belting.



Research Belting's higher coefficient of friction, greater flexibility and strength, and less permanent stretch (results of Home of Research Laboratory work) produce profits for you from the Bonus Zone.

In our Home of Research "Torture Chamber" there are machines which put to test every quality of belting on which transmission depends.

Cruelly, ceaselessly, they tear, pound, lash, whip . . . testing Research Belting against the best that competition provides . . . against the belting we made last year . . . experimental belts against each other.

On these machines, the odds are always even, but the same belting always wins. For our engineers . . . constantly developing new materials and methods for selecting, tanning, currying and finishing . . . keep Research ahead of the field!

On your machines, this same belting will create a Bonus Zone between the pulleys. Because it delivers full power, it increases average machine speed . . . and makes possible the production of extra units without extra production cost.

An air products company earns 17 2/3¢ extra profit per unit.

Another manufacturer gets 2¼% more production.

A drilling operation was cut from 8 to 6 minutes.

. . . simply by changing to Research Belting.

Look in THOMAS' REGISTER or 'phone Western Union for nearest G & K Distributor. 1-24 hr. delivery to any point.

MODERN GROUP-DRIVE

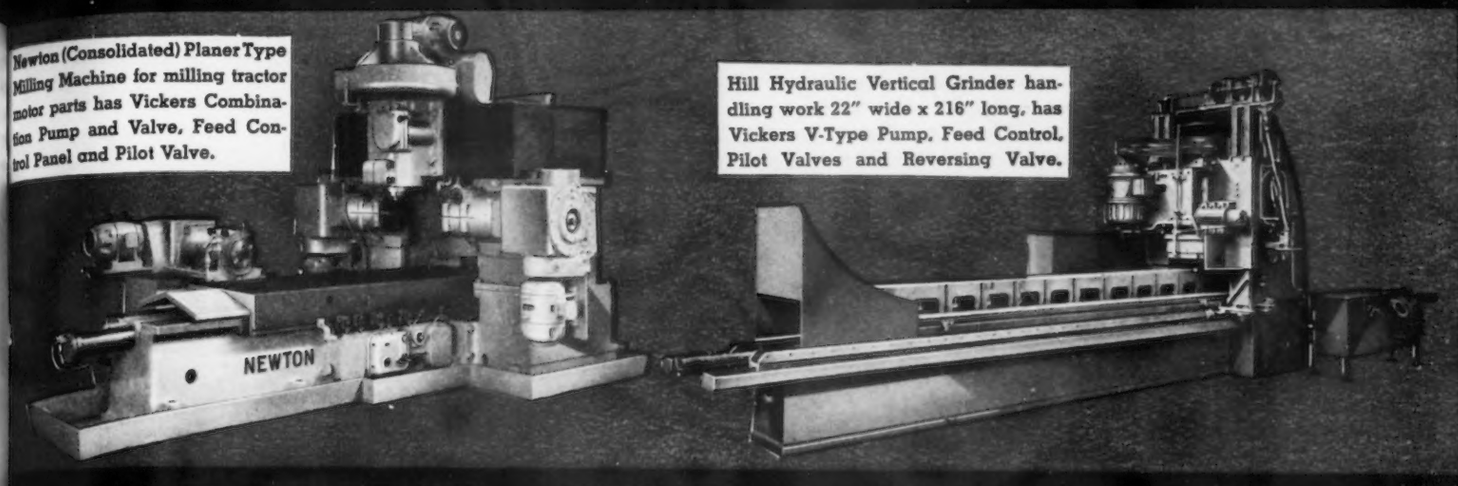
GRATON AND KNIGHT

HOME OF RESEARCH

so that POWER TRANSMISSION shall be better

GRATON & KNIGHT CO., WORCESTER, MASSACHUSETTS

OTHER PRODUCTS—BELT CEMENTS AND DRESSINGS—LEATHER PACKINGS—LACE LEATHER—CUT LACE—HAND LEATHERS—WHOLE LEATHER AND SCRAP LEATHER



Newton (Consolidated) Planer Type Milling Machine for milling tractor motor parts has Vickers Combination Pump and Valve, Feed Control Panel and Pilot Valve.

Hill Hydraulic Vertical Grinder handling work 22" wide x 216" long, has Vickers V-Type Pump, Feed Control, Pilot Valves and Reversing Valve.

HEAVY MACHINERY

finds

VICKERS HYDRAULIC EQUIPMENT

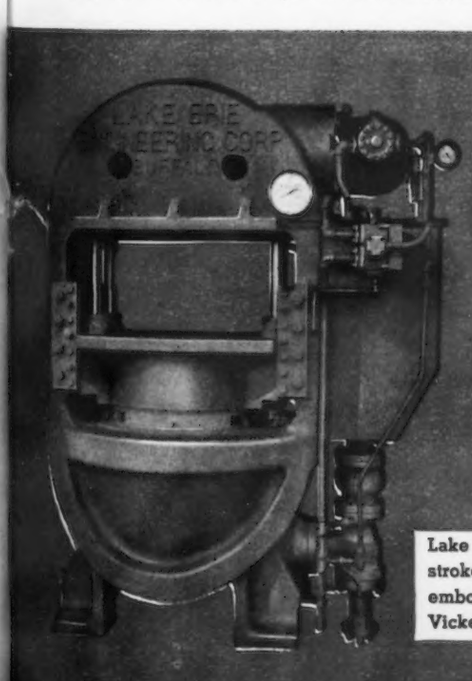
advantageous

● ILLUSTRATED are a few of the infinite variety of applications of Vickers Hydraulic (Oil) Feeds and Controls to heavy machinery of all kinds. Vickers single-stage and two-stage vane-type pumps will supply pressures of 1000 and 2000 lbs. per sq. in. respectively for *continuous duty*. ● Standard valves, panels, etc., are available for handling the high pressures and large volumes necessary to transmit the power required for this class of service. Pumps and valves are provided with flanged connections and forged steel pipe flanges for heavy duty service. Smooth feeds are assured on large heavy machines regardless of variations in work resistance and hydraulic pressure. Feed rates are infinitely varied by simply moving a dial. ● Practically any feeds and sequence of motions can now be obtained by various arrangements of *standard* Vickers pumps, valves, etc. Write for data regarding applications that interest you.

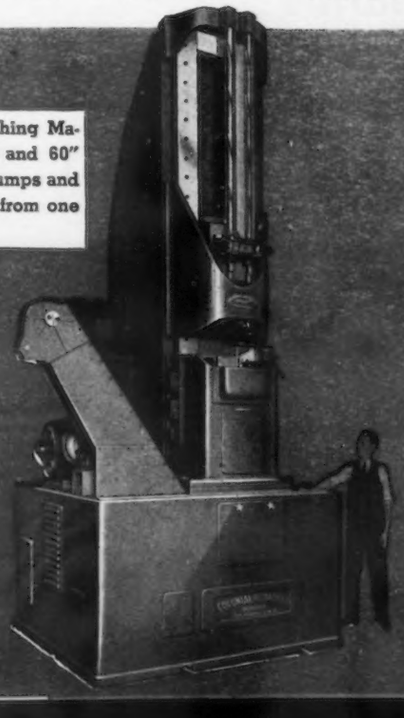
VICKERS *Incorporated*

1400 OAKMAN BLVD. • DETROIT, MICH.

MORE SIMPLE, EFFICIENT AND ECONOMICAL HYDRAULIC FEEDS AND CONTROLS



Lake Erie 2000-ton high speed (6 strokes per min.) die sinking and embossing press provided with Vickers Hydraulic Equipment.



Colonial Hydraulic Spiral Broaching Machine having 30 tons capacity and 60" stroke equipped with Vickers Pumps and Controls. Machine is controlled from one pilot valve.



. . . of Spring making

From wire . . . to coiler . . . to shipping room. Simple enough isn't it? Most anyone should be able to make springs . . . it's "*a-b-c*" stuff.

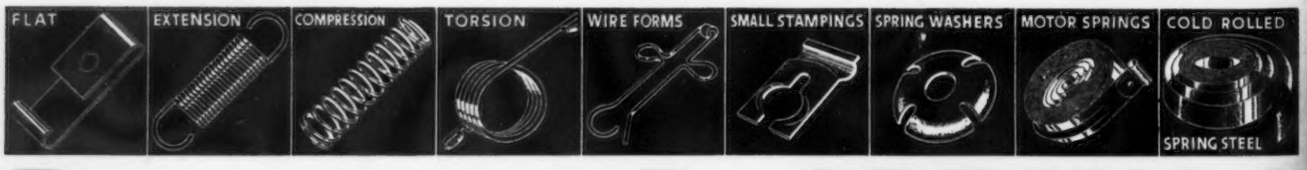
But it's the "*x-y-z*'s" of spring making that make a spring perform. . . material, design, temper, accuracy. And you can't find the answer to these quantities without an equal mixture of metallurgical and engineering knowledge plus plain experience. All signs point to increased demands for performance. Springs are needed . .. specially made for particular jobs. A good springmaker can be a friend indeed.

Let Barnes Quote

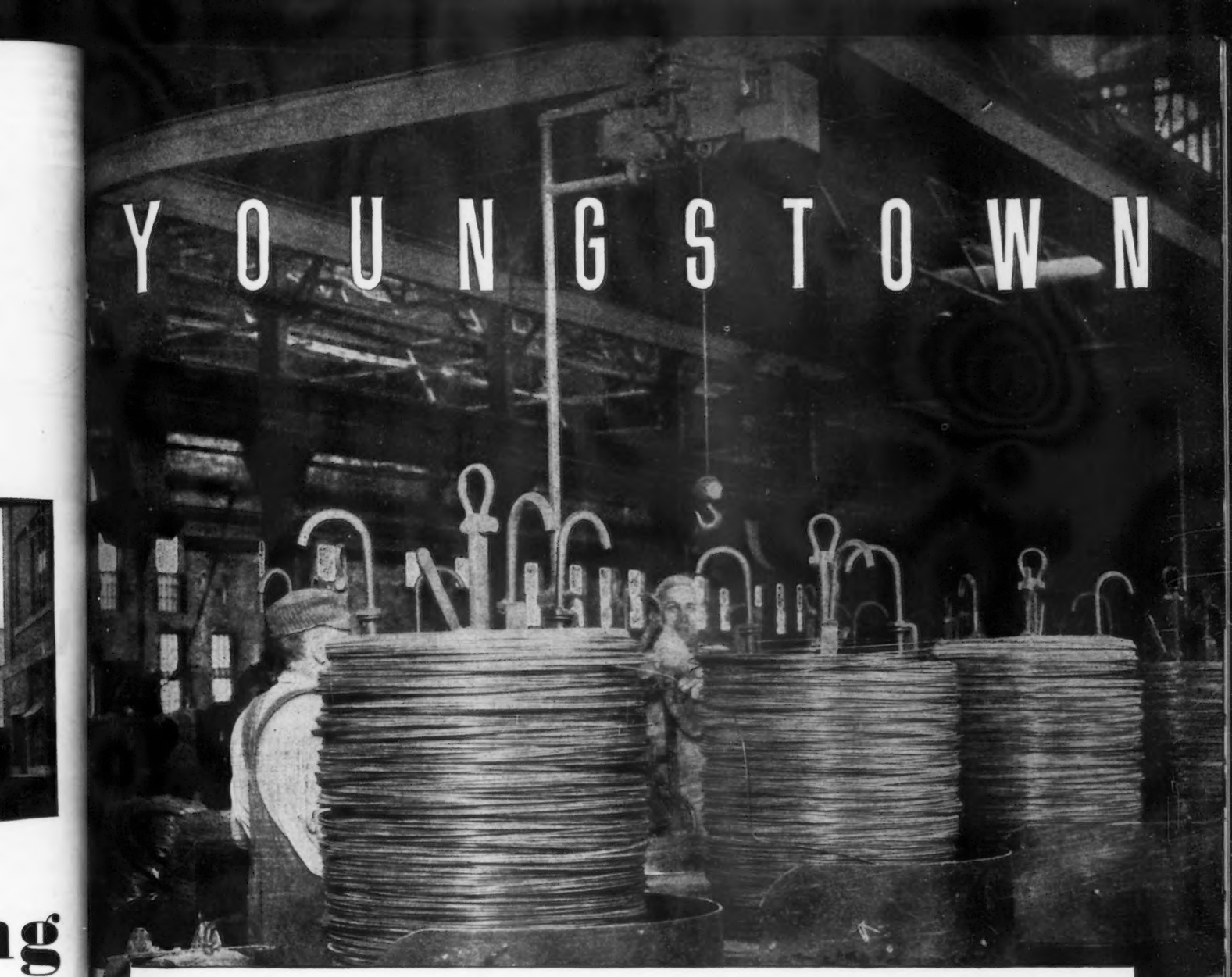
We like to make friends–by deeds –not promises.

THE WALLACE BARNES CO., *Bristol Connecticut*

SPRINGMAKERS FOR MORE THAN THREE QUARTERS OF A CENTURY



Barnes-made SPRINGS



If there is one reason which, above all others, makes it good business to standardize on YOUNGSTOWN Wire it is the uniformity with which you will get the wire you specify.

....Once you tell YOUNGSTOWN that a shipment of wire is exactly meeting your needs, you can go into production without worrying. The next shipment and every later one will accurately match up.

THE YOUNGSTOWN SHEET AND TUBE COMPANY

Manufacturers of Carbon and Alloy Steels

General Offices - . - YOUNGSTOWN, OHIO

Tubular Products; Sheets; Plates; Tin Plate; Bars; Rods; Wire; Nails; Conduit; Unions; Tie Plates and Spikes.

MANUFACTURER'S TRADE MARK YOUNGSTOWN WIRE

Responsive to Beauty Treatment



STEEL, once but a hard working Cinderella among metals, is now fashioned into many products of glowing beauty. Graceful form and lovely color have been added to man's most useful metal. In the case of sanitary fixtures and household equipment, stamped and drawn rolled metal permits a latitude in styling for beauty which is impossible with other materials. And weight is radically reduced.

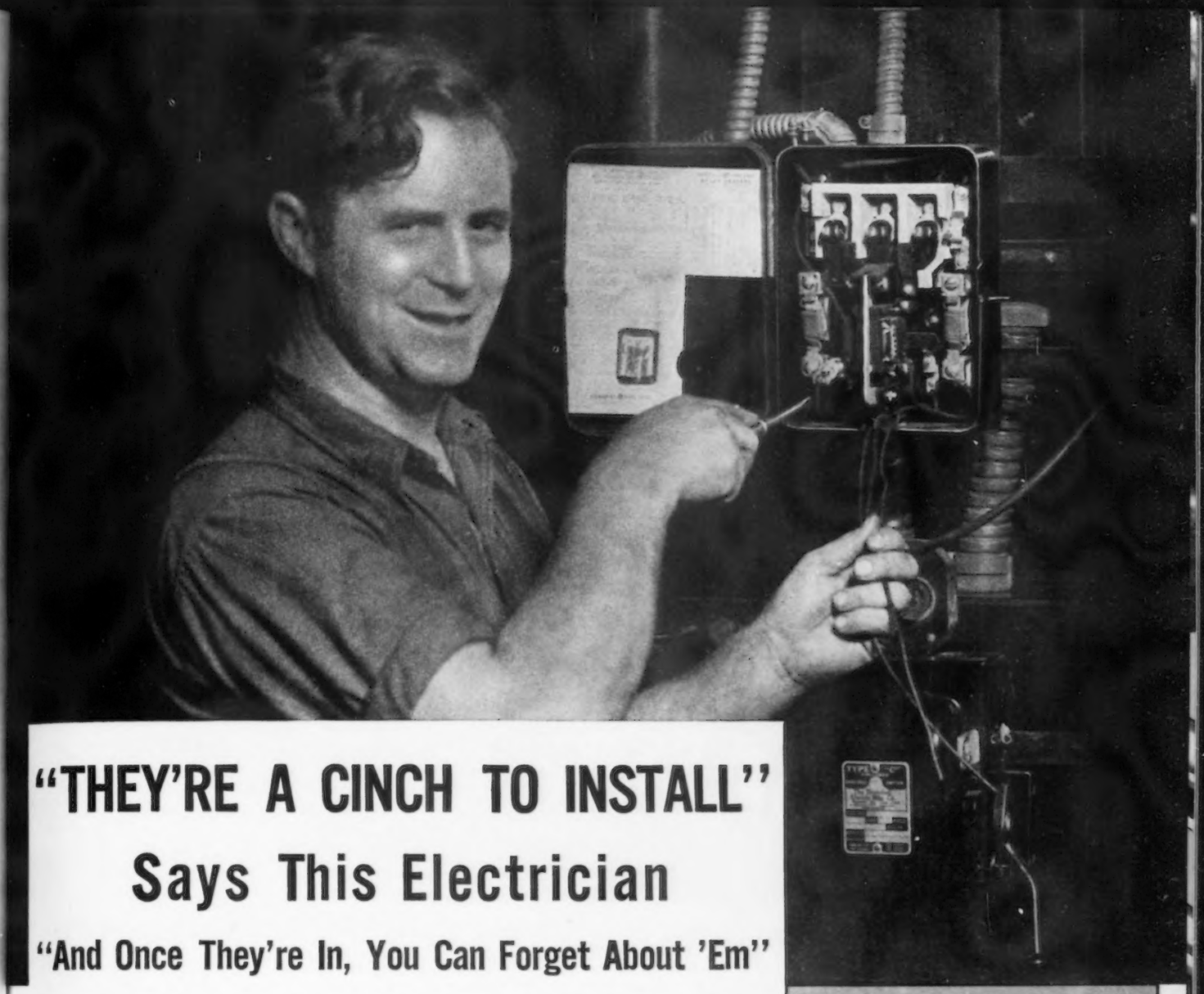
Great Lakes Steel Corporation, with extensive experience in this field, knows the requirements of manufacturers, and meets them in generous measure. Michigan Metal for vitreous enameling. Cold rolled sheets for lacquering.

GREAT LAKES STEEL CORPORATION, DETROIT, MICHIGAN, *Division of National Steel Corporation*

HOT ROLLED STRIP . . . CARBON STEEL BARS . . . PLATES . . . SPRING STEEL . . . BILLETS . . . COLD ROLLED SHEETS . . . PICKLED SHEETS . . . BLACK SHEETS . . . MICHIGAN METAL FOR VITREOUS ENAMELING . . . *Widths up to 90"*

GREAT LAKES STEEL

UNIT OF NATIONAL STEEL



"THEY'RE A CINCH TO INSTALL" Says This Electrician

"And Once They're In, You Can Forget About 'Em"

"I DON'T have to do a lot of monkeyin' around to install G-E magnetic switches," says this electrician. "Whoever designed them must have known what we electricians are up against."

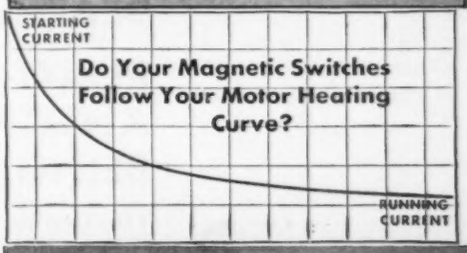
Well, this man should know—wiring switches is part of his business.

Certainly we try to build our magnetic switches to make installation as simple as possible. For instance, the cases are roomy enough to allow a man to work on the switch with a screw driver or pliers. And if he wants to remove the switch from its case, he has only to take out three screws. The terminals, likewise, are located in a convenient position, there are plenty of knockouts, and you can lift the arc chutes out with your fingers. That electrician is right—G-E magnetic switches are "a cinch to install."

But our magnetic switches will give you a lot of unique benefits after installation, too. As a matter of fact, they are the only devices of their type that will give you full overload-relay protection. This means that not only are your motors protected against harmful overloads, but also that the motors can continue in operation when the overload is harmless and of short duration. It's a simple relay, but it will follow closely the heating characteristics of your motor, and it will eliminate unnecessary shutdowns and save the time of your operators. General Electric, Schenectady, N. Y.

GENERAL ELECTRIC

FULL PROTECTION ALL THE WAY WITH G-E MAGNETIC SWITCHES



General Electric Company
Dept. 6—201, Schenectady, N. Y.

I should like to know more about G-E magnetic switches. Please send me your Bulletin GEA-841E.

Name.....

Company.....

Address.....

080-69



Rolling on to GREATER RECORDS

Consider the following facts. We believe them to be the most impressive to be found in the bearing industry.

MORE NEW BANTAM INSTALLATIONS LISTED DURING 1935 THAN ALL OTHERS COMBINED.*

800% INCREASE IN DEMAND FOR BANTAM BEARINGS SINCE 1932.

PLANT CAPACITY INCREASED 60% LAST YEAR. ANOTHER ADDITION OF EQUAL SIZE NOW BEING BUILT.

The demands of steel men who want *better* bearings are making possible this wonderful record. We are glad you recognize Bantam superiority. With our new plant and equipment we shall endeavor to make them even better.

*Iron and Steel Engineer Sept., 1935, Report. Reprints will be sent by us without cost.

THE BANTAM BALL BEARING CO.

(SUBSIDIARY OF THE TORRINGTON CO.)

SOUTH BEND, INDIANA

CHICAGO
PHILADELPHIA
TOLEDO

CLEVELAND
PITTSBURGH
WASHINGTON, D.C.

DETROIT
MILWAUKEE

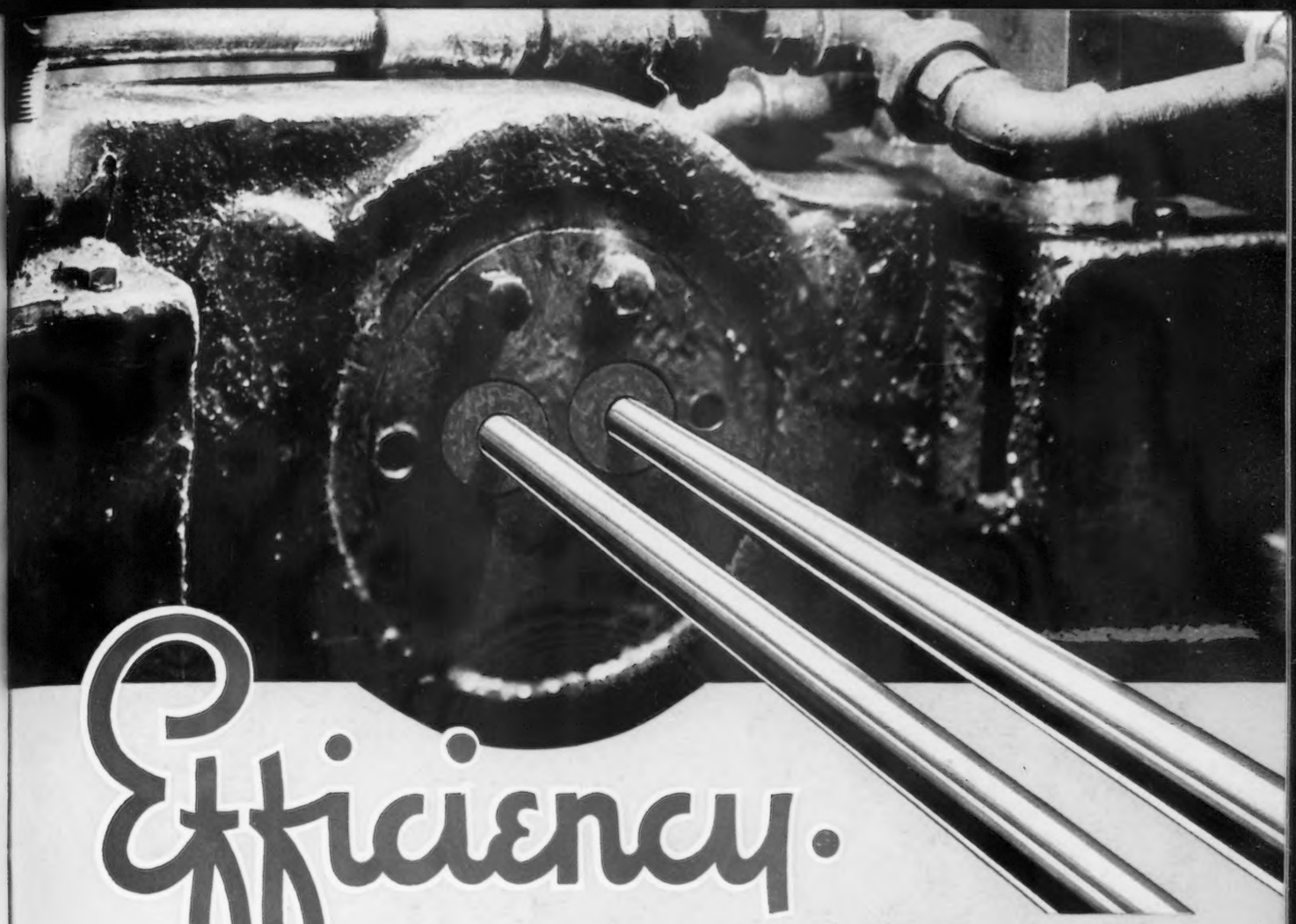
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BBB

TAKE YOUR TOUGHEST BEARING JOB TO BANTAM



Efficiency.

. . . AN INHERENT QUALITY OF STEELS THAT ARE UNION COLD DRAWN

Promote Efficiency

WITH UNION COLD DRAWN STEELS

• Efficiency is an inherent quality of Union Cold Drawn Bars because of their special characteristics and also because of their striking uniformity throughout duplicate lots. In run after run of steel through manufacturing operations they are found true and uniform to required size, cross section, finish, straightness and physical properties. This is accomplished with Union Drawn's highly perfected processes controlled by experienced judgment in production and frequent use of tests and inspections.

Mass production demands a constant flow of uniform materials. The qualities of incoming shipments must dovetail with those of previous deliveries so that shop practice proceeds without distinguishing one lot from another. The same steel and the same methods produce the same results and only this combination can maintain efficiency, once it is achieved.

Union Cold Drawn Steels have put many manufacturers on an efficient production basis and kept them there. These steels rank as first choice among those buyers who insist on the last penny in cost reduction.

UNION DRAWN STEEL CO., MASSILLON, OHIO

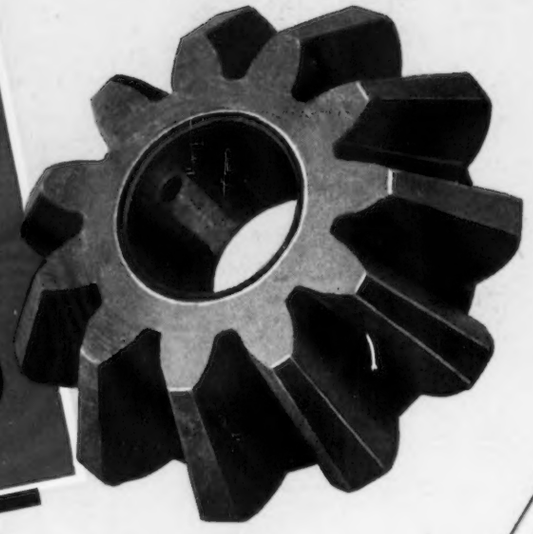
Manufacturers of Efficiency Steels

SUBSIDIARY OF

REPUBLIC STEEL

REPUBLIC STEEL CORPORATION

UNION DRAWN PROCESSING GIVES MAXIMUM MACHINABILITY TO Alloy Steels





• Radical improvements in the machinability of Union Cold Finished Alloy Steels have lowered the cost of machined parts made from the alloys.

Modern metallurgy has developed a wider understanding of the relation of microstructure of steel to its cutting qualities. Closely controlled annealing cycles supplemented by microscopic checks, and careful selection of proper cold working methods, enable us to make fullest use of this broader knowledge to develop machinability to a high degree. Once the requirements of fabrication are known, each lot of alloy steel can be processed to meet your needs for faster production.

Manufacturers who use alloy steel bars are invited to consult with Union Drawn Metallurgists on matters relating either to machinability or to selection of the most efficient steel grade for their requirements.

UNION DRAWN STEEL CO., MASSILLON, OHIO

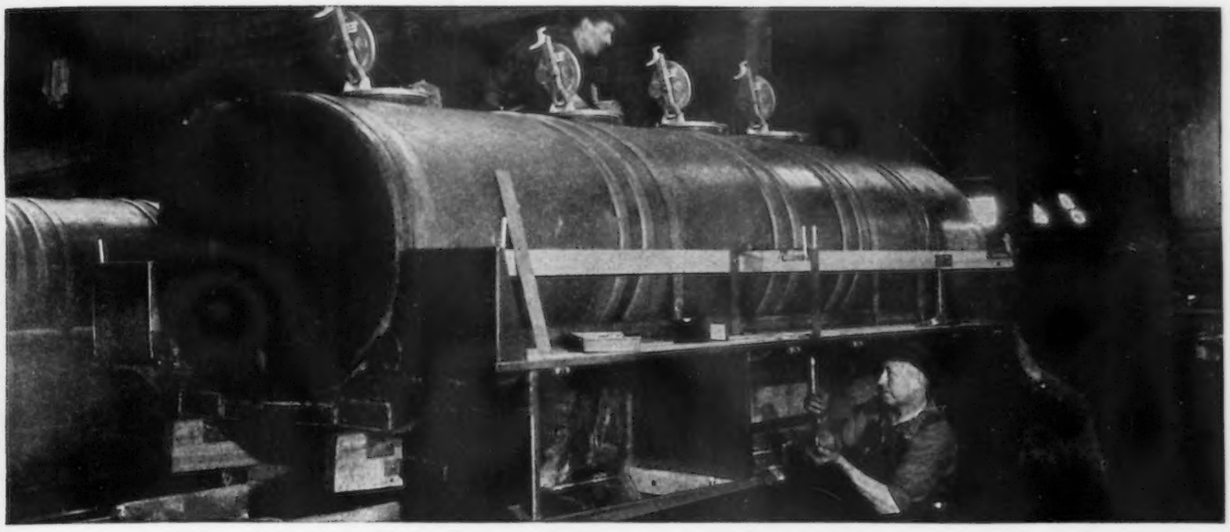
Manufacturers of Efficiency Steels

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REPUBLIC STEEL CORPORATION

Union Cold Drawn Steels



● The job goes together and it's a clean job conforming precisely to design with ARMCO H.T.50.

ALL THE STRENGTH YOU NEED

Plus Easy Fabrication . . . that's ARMCO H.T. 50

Whatever you build with high-tensile sheet steel—truck tanks, passenger buses, railroad cars or what-have-you — you can build it stronger, safer and, in many cases, lighter, with ARMCO H.T.50.

Here is a *practical* steel for *practical* design engineers and fabricators. Practical, because it gives you all the strength you'll ever need with easy working and welding qualities. It gives you, in fact, a yield point between 47,000 and 52,000 lbs. per sq. inch, depending on the grade, hot-rolled or cold-rolled. Shop men like the way ARMCO H.T.50 shears, bends, forms, flanges and welds. It makes a neat job and a job low in cost. No longer is it necessary to labor over a steel that's so high in useless tensile strength that it is almost impossible to work it with ordinary shop equipment. ARMCO H.T.50 solves this problem handily.

To sum up, ARMCO H.T.50 offers you practical design values, strength and ductility, high impact resistance, greater endurance limit, and sound, tough welds. And there's a right grade and finish in sheets, strip and plate for your specific application. Just tell us what this application is and we'll provide helpful information. The American Rolling Mill Company, Executive Offices, 703 Curtis St., Middletown, Ohio.

ARMCO

ARMCO H.T. 50

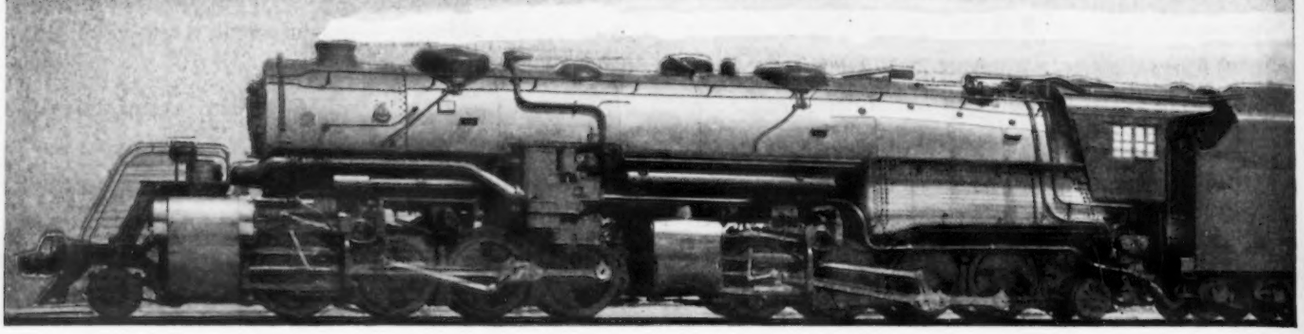
● In the brake as in bending, flanging, die-stamping and welding, ARMCO H.T.50 is a surprisingly workable metal. Try it and see.

● This operator likes to weld ARMCO H.T.50. He says "it flows nicely, fuses solidly and never has to be re-welded." One of H. T. 50's big features is, no special electrode is needed.





Another case where SPECIAL PLATES *by* BETHLEHEM *solved the problem*



IN an effort to obtain plates that would improve performance and eliminate difficulty in the boiler shop a prominent eastern railroad bought a nickel steel plate from Bethlehem to replace a ruptured boiler course.

After the installation of this plate the railroad's master boilermaker said, "This Bethlehem Plate is the best I've ever seen. It worked fine. We had no trouble in handling it." Since this initial application the railroad has placed orders with Bethlehem for boiler plates for seven more locomotives of the same type.

The record of this nickel steel plate is typical of results obtained when Bethlehem makes plates, whether special plates for special purposes or ordinary carbon steel plates for everyday applications.

Unsurpassed facilities and broad experience combine to make Bethlehem a highly satisfactory source for plates for every industrial requirement.

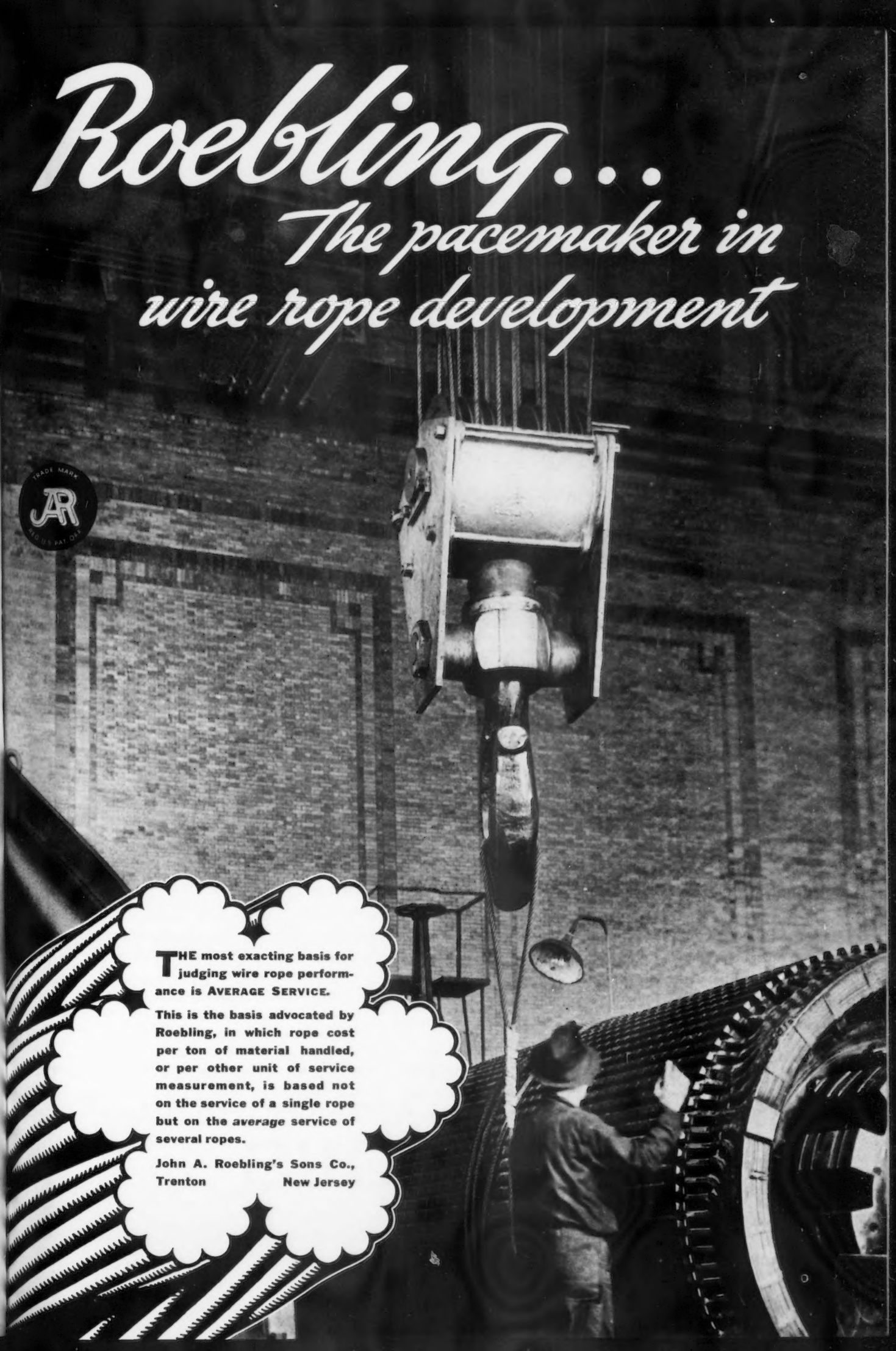
BETHLEHEM STEEL COMPANY, *General Offices:* Bethlehem, Pa. *District Offices:* Albany, Atlanta, Baltimore, Boston, Bridgeport, Buffalo, Chicago, Cincinnati, Cleveland, Dallas, Detroit, Hartford, Honolulu, Houston, Indianapolis, Kansas City, Los Angeles, Milwaukee, New York, Philadelphia, Pittsburgh, Portland, Ore., Salt Lake City, San Antonio, San Francisco, St. Louis, St. Paul, Seattle, Syracuse, Washington, Wilkes-Barre, York. *Export Distributor:* Bethlehem Steel Export Corporation, New York.

BETHLEHEM STEEL COMPANY

BETHLEHEM STEEL

Roebling...

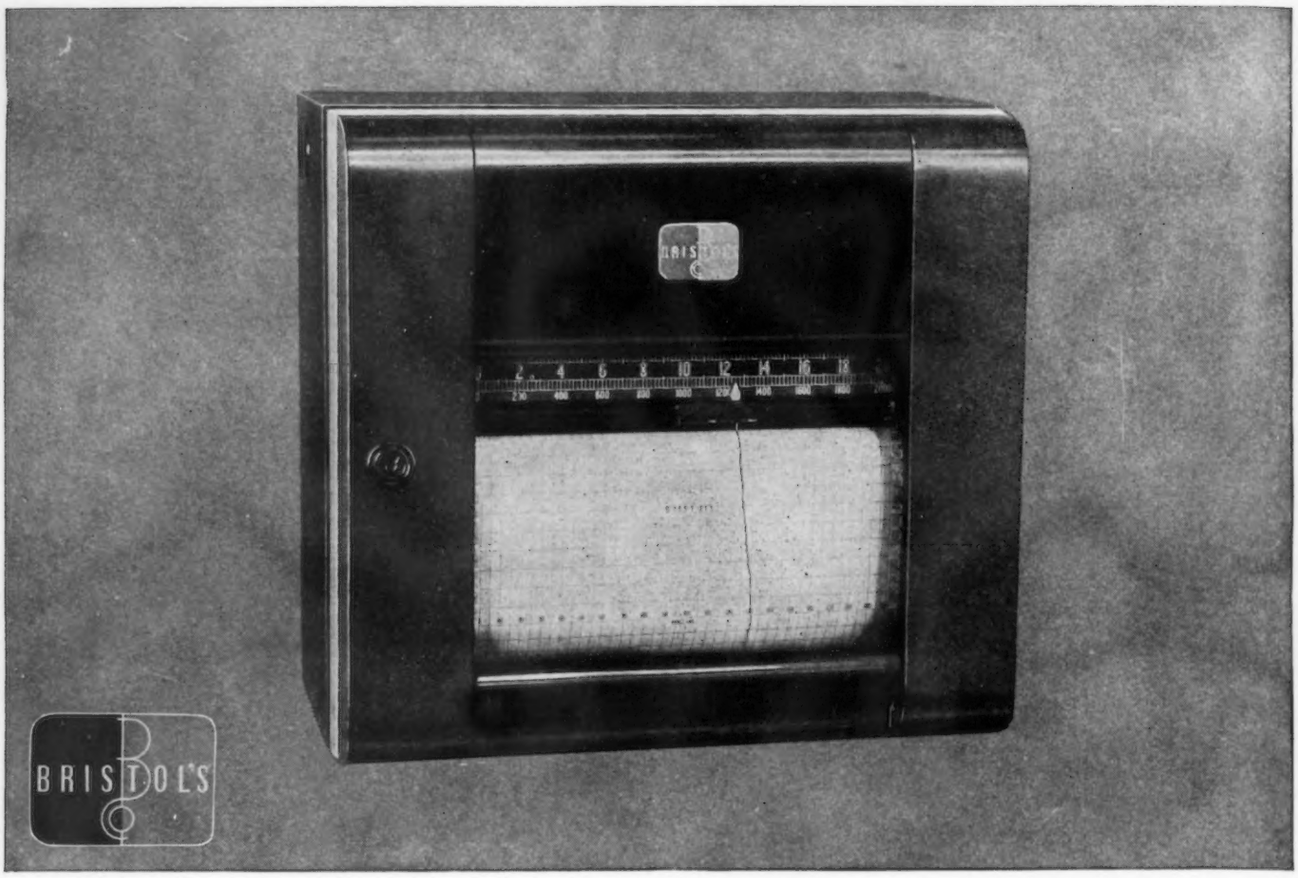
The pacemaker in wire rope development



THE most exacting basis for judging wire rope performance is AVERAGE SERVICE.

This is the basis advocated by Roebling, in which rope cost per ton of material handled, or per other unit of service measurement, is based not on the service of a single rope but on the *average* service of several ropes.

John A. Roebling's Sons Co., Trenton New Jersey



These accuracy-promoting features *welcome your close examination*

PLANTS THAT now are using Bristol's Wide Strip Potentiometer Pyrometer are marveling at the surprising accuracy of control obtainable—both under abnormal as well as normal conditions.

You can readily see why this is so. The long 12¼ cm. galvanometer pointer magnifies the most minute deflections. The extra wide 12¼ inch strip chart promotes still closer accuracy. So, too, do the duplex slide wires—by insuring good contact and smoothing out the slight inevitable variations in circuit resistance. The integral mounting of slide wire contact and recording pen abolishes backlash—and its corresponding error in precision measurement.

There are nearly a hundred other features you will want to know about. Write for Catalog 1450-A. Or, if you prefer, test this new Bristol's Potentiometer Recorder Controller yourself. Then compare!

FEATURES AT A GLANCE!

1. Extra wide 12¼ inch chart.
2. Indicating scale, 1¼ inches high, of far vision design.
3. Fully automatic—self-standardizing, self-balancing, self-compensating.
4. Unit mounting of recording pen and duplex slide wire contact.
5. Dust-proof housing for galvanometer.
6. Duplex slide wires.
7. Case moisture-proof, fume-proof and dust-proof. For wall or panel mounting.
8. Convenient control-index knob.
9. Mercury in glass control switches.
10. Grease-sealed ball bearings; self-lubricating journals.

THE BRISTOL COMPANY ✎ WATERBURY ✎ CONNECTICUT

Branch Offices: Akron, Birmingham, Boston, Chicago, Detroit, Los Angeles, New York, Philadelphia, Pittsburgh, St. Louis, San Francisco
Canada: The Bristol Company of Canada, Limited, Toronto, Ontario *England: Bristol's Instrument Company, Limited, London, S.E. 14*

BRISTOL'S

TRADE MARK REG. U. S. PAT. OFF.

POTENTIOMETER RECORDER CONTROLLER

We're proud of a

VETERAN'S TRUST

WESTINGHOUSE is an honorable name in the industrial field. We congratulate this veteran on its 50th anniversary.

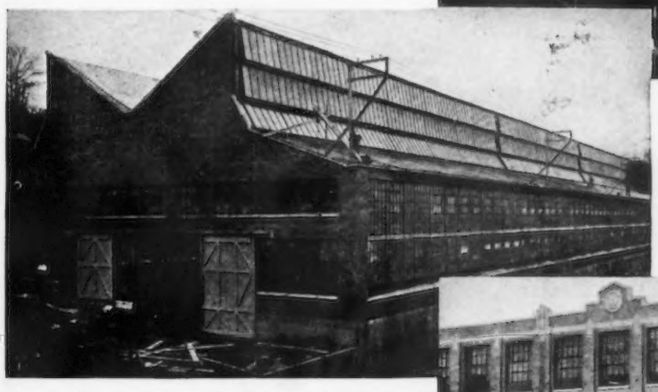
And to industry at large we say frankly that we are very proud of the confidence placed in our organization since its founding in 1900, and in our own predecessor companies before that time.

This confidence has been shown by our past participation in the building of a multitude of steel structures of varied types — and again demonstrated by Westinghouse by calling upon us to fabricate and erect the steel framework for a welded Warehouse and Office Building at Mansfield, Ohio, a project now under contract.





(Above) *Structural steel for the Westinghouse office building and viaduct at East Pittsburgh, Pennsylvania, was fabricated and erected by American Bridge Company.*



(Above) *This brass foundry building was fabricated and erected at Linhart, Pennsylvania, for Westinghouse by American Bridge Company.*

(Right) *American Bridge Company fabricated the welded steel structure for this Westinghouse warehouse and service building at Newark, New Jersey.*



(Above) *Welded construction was used in the Westinghouse central engineering laboratory building and viaduct at East Pittsburgh, Pennsylvania. It was fabricated by American Bridge Company.*

A M E R I C A N B R I D G E C O M P A N Y

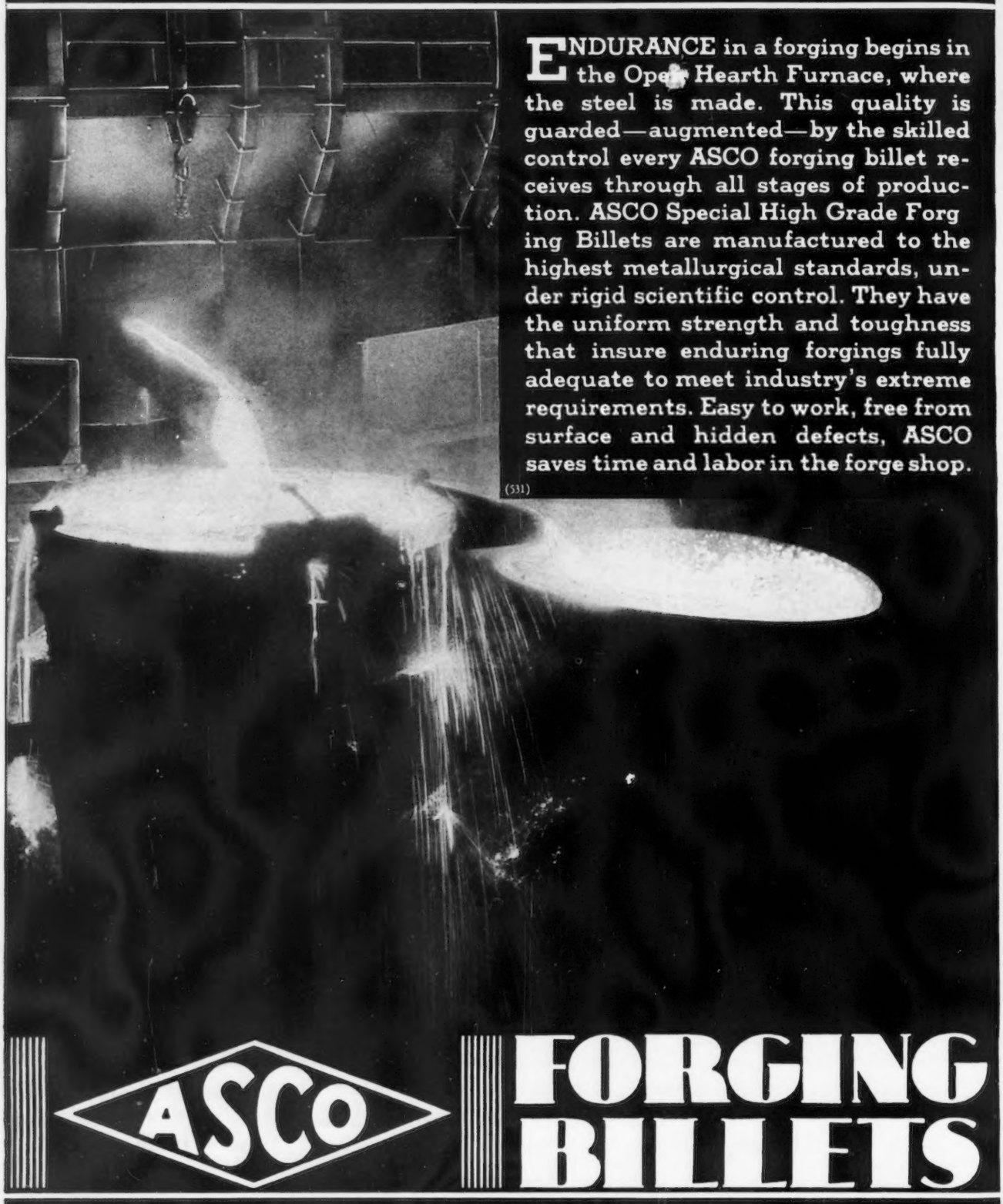
General Offices, Frick Building, Pittsburgh, Pa.

Baltimore · Boston · Chicago · Cincinnati · Cleveland · Denver · Detroit
Duluth · Minneapolis · New York · Philadelphia · St. Louis

Columbia Steel Company, San Francisco, *Pacific Coast Distributors*
United States Steel Products Company, New York, *Export Distributors*

UNITED STATES STEEL

ENDURANCE



ENDURANCE in a forging begins in the Open Hearth Furnace, where the steel is made. This quality is guarded—augmented—by the skilled control every ASCO forging billet receives through all stages of production. ASCO Special High Grade Forging Billets are manufactured to the highest metallurgical standards, under rigid scientific control. They have the uniform strength and toughness that insure enduring forgings fully adequate to meet industry's extreme requirements. Easy to work, free from surface and hidden defects, ASCO saves time and labor in the forge shop.

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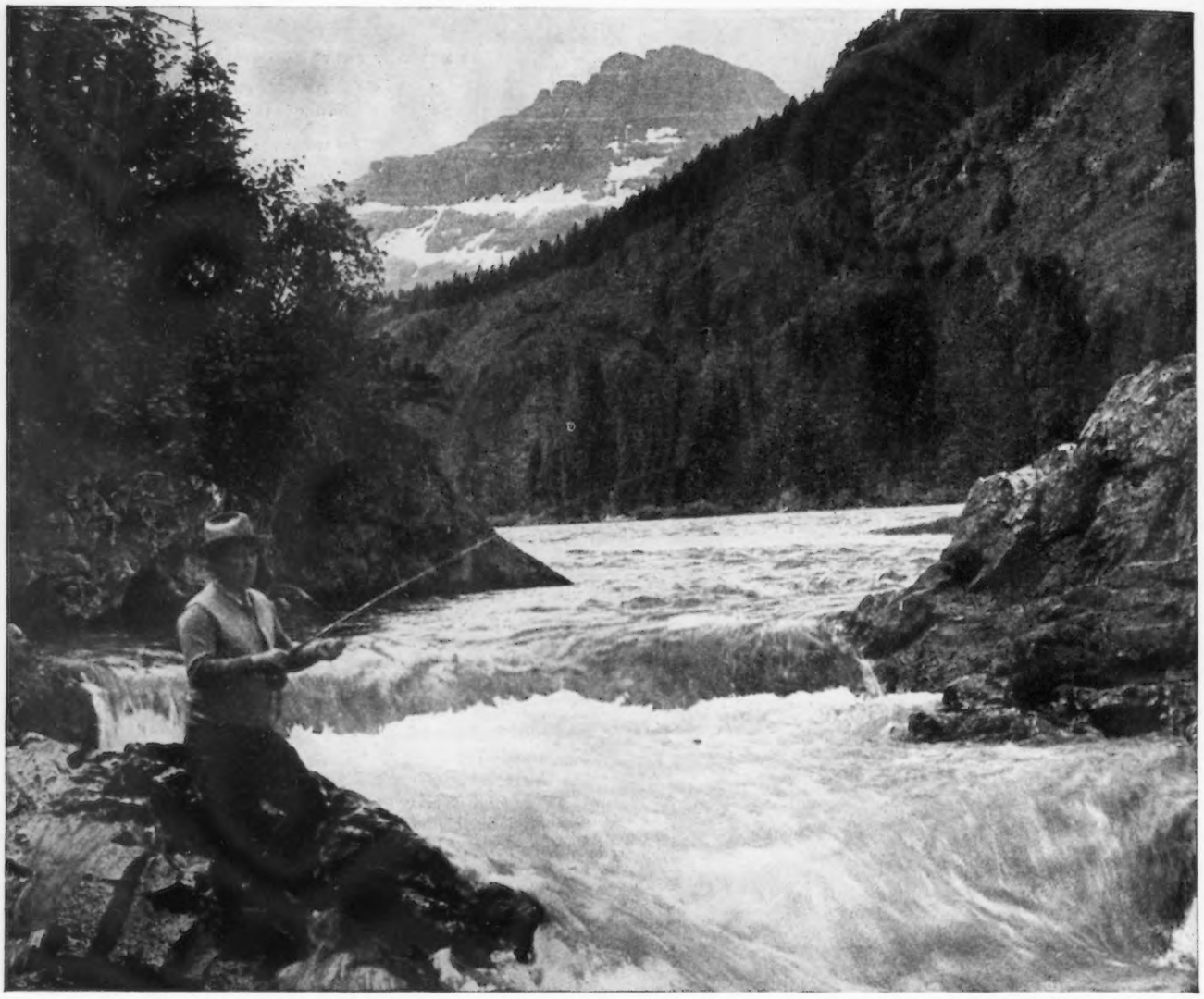
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... THE IRON AGE ...

JUNE 25, 1936

ESTABLISHED 1855 Vol. 136, No. 26

Fertile Years of Accomplishment

IF one were to ask the average American which of our great industries has made the longest strides within the last half century, the answer would probably be "the automotive industry."

May we say, without in the least depreciating the magnificent accomplishments of the motor car and aircraft makers, that this would be a wrong answer?

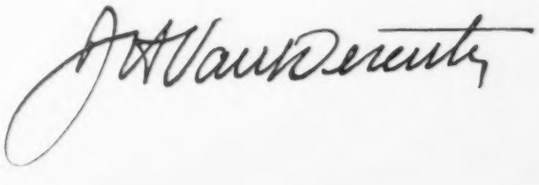
By all odds, the palm for creative achievement on a broad and expanding front must be awarded to the electrical industry.

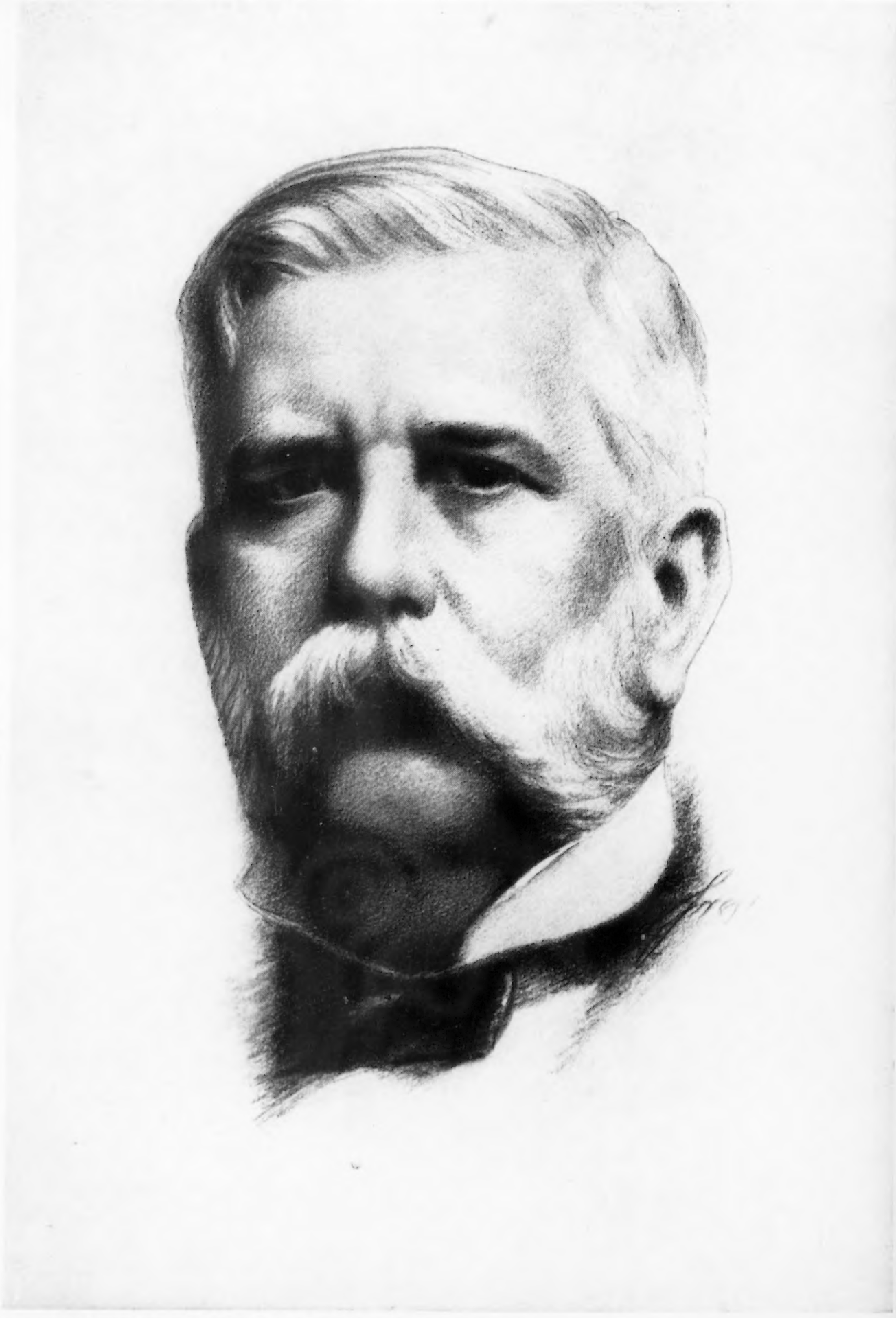
The motor car makes its dramatic appeal because it is so visible. The work of electrical apparatus and of electricity is largely invisible. Yet it is universal. One can hardly find a nook or cranny in industry, in the home or in any public place where the hand of electricity or some of its busy fingers are not diligently at work.

Yet, but 50 years ago, electricity had not become a servant. It was then only an academic wonder, a plaything for scientists. Today, electricity and its tools are perhaps the most universally applied task doers that we have to command.

It is a pleasing thought to us that our metal-working industry made the harnessing of electricity possible. The great electrical equipment companies are members of our metal-working fraternity. Their achievements shed luster upon machinery and metals as well as upon the creative power of industrial initiative.

On the succeeding pages you will find a word and picture "character study" of one of the famous metal-working companies that has contributed so much to the creation of the great electrical industry, the Westinghouse Electric & Manufacturing Co., now celebrating its Golden Jubilee.





Portrait of GEORGE WESTINGHOUSE. Drawn by John Frew for The Iron Age.

The First FIFTY YEARS



1886

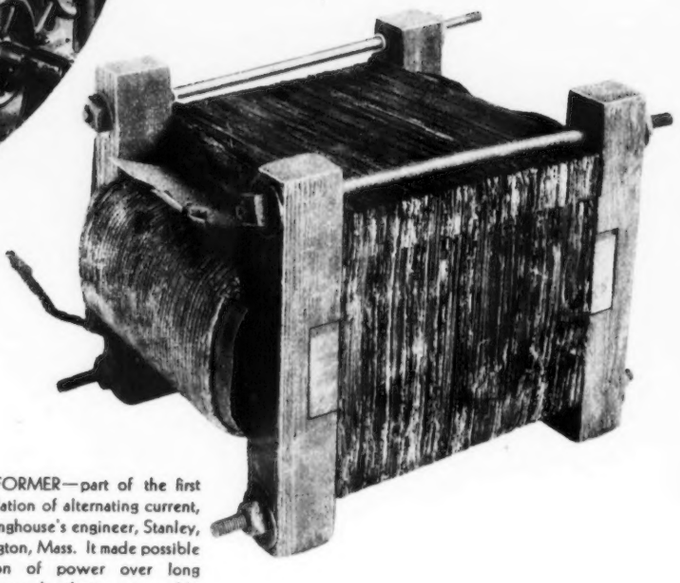
A commemoration by The Iron Age of the Golden Jubilee of an outstanding example of American initiative and enterprise and of a great metal-working organization, Westinghouse Electric & Manufacturing Company.

1936

"Let There



TYPICAL Westinghouse alternating current generator built in 1886-87 and shown installed at the Westmoreland Electric Co., Greensburg, Pa. The single phase generator had a smooth armature core covered with a single layer of wire, and produced 133 cycles at 1000 volts.



FIRST TRANSFORMER—part of the first practical installation of alternating current, made by Westinghouse's engineer, Stanley, at Great Barrington, Mass. It made possible the transmission of power over long distances and mass distribution at useable voltages.

IN the story of the creation given in the book of Genesis, the first great command was "Let there be light."

It is a fascinating thought that the great electrical industry of today owes its inception to obedience to this same age-old command. For back in the early 1880's, the primary goal of the electrical pioneers was the practicalizing of "wired" light. Power transmission to electrify our turning wheels of industry was to come later, and as a result of what "wired" light revealed.

The stage was already set, in those early days, for the drama of electrification. Some of the players, such as the arc light, the incandescent lamp and direct current transmission, already had rehearsed their lines, but the principal character, without which the play could not succeed, had not made its appearance. It was alternating current.

When we consider the extent to which electricity serves us in manifold fashion, and realize that the breadth and economy of this service depend upon the use of alternating current; when we consider that 95 per cent of all of the current generated and transmitted throughout the world is of this nature, we are in position to appreciate the magnitude of achievement and the high degree of public service rendered by George Westinghouse. For it was he who introduced the principal character, taught him his lines and thereby made the drama of electrification a success.

Throw aside, if you will, all of the many other achievements of Westinghouse and this one would still be sufficient to permanently enroll his name in the register of our immortals.

George Westinghouse was an "organizer" as well as an inventor. Unlike many men of the inventive type of mind, he did not consider himself to have a monopoly of ideas. He realized that the problem before him was not of one-man caliber. That is why he sought out and drew to himself in those early days such men as William Stanley, O. B. Shallenberger and Albert Schmid and later Nikola Tesla, all of whom were alternating current minded.

In attempting to explore new technical frontiers one does not merely find the key to a single door, open it and step through to achievement. Rather it is a succession of doors, large and small, that are interposed between the seeker and the sought and he must find the keys to one after the other. It was so with alternating current transmission. To make it commercially feasible there was needed a transformer that would step the voltage down from that suitable for economical transmission to that required by the incandescent lamp.

e Be Light" . . .

William Stanley found the key to that door in 1885 after a year of experimental work at Pittsburgh and Great Barrington, Mass., which resulted in an "induction coil" which was the prototype of all of the transformers since built.

Having discovered and used this key, it did not take Stanley long to demonstrate the feasibility of alternating current wired light. So he was able, on March 17, 1886, to write to George Westinghouse as follows:

"I have run wires from the laboratory to the village and have placed a 'converter' in my cousin's store in order to test the commercial necessities. The lamps in the store were running well last night. . . . I am striving all I can to finish this system for you at the earliest possible date. . . . I might say a great deal about this system but briefly, it is all right."

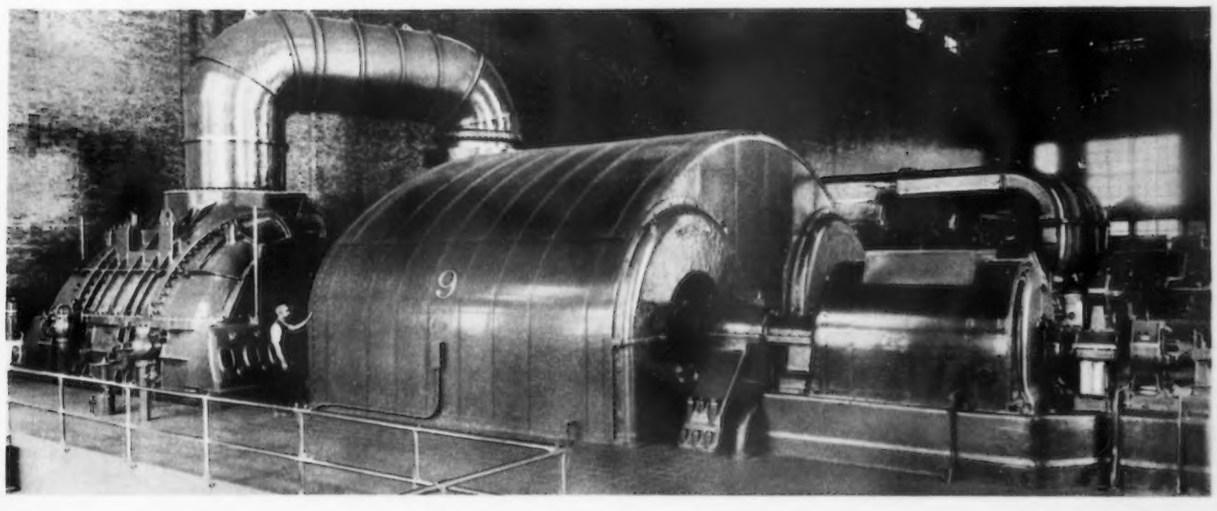
Being now assured of the possibilities of alternating current for lighting and doubtless even then envisaging a picture of still broader applications, Mr. Westinghouse decided to organize a company to manufacture the apparatus. Thus, fifty years ago in 1886 was formed the Westinghouse Electric Co. for the purpose of manufacturing the apparatus required for "wired" light. Its domicile was a small rented shop on Garrison Alley, Pittsburgh, its employees during the first year were less than 200 and its total sales for that year amounted to less than $180,000.

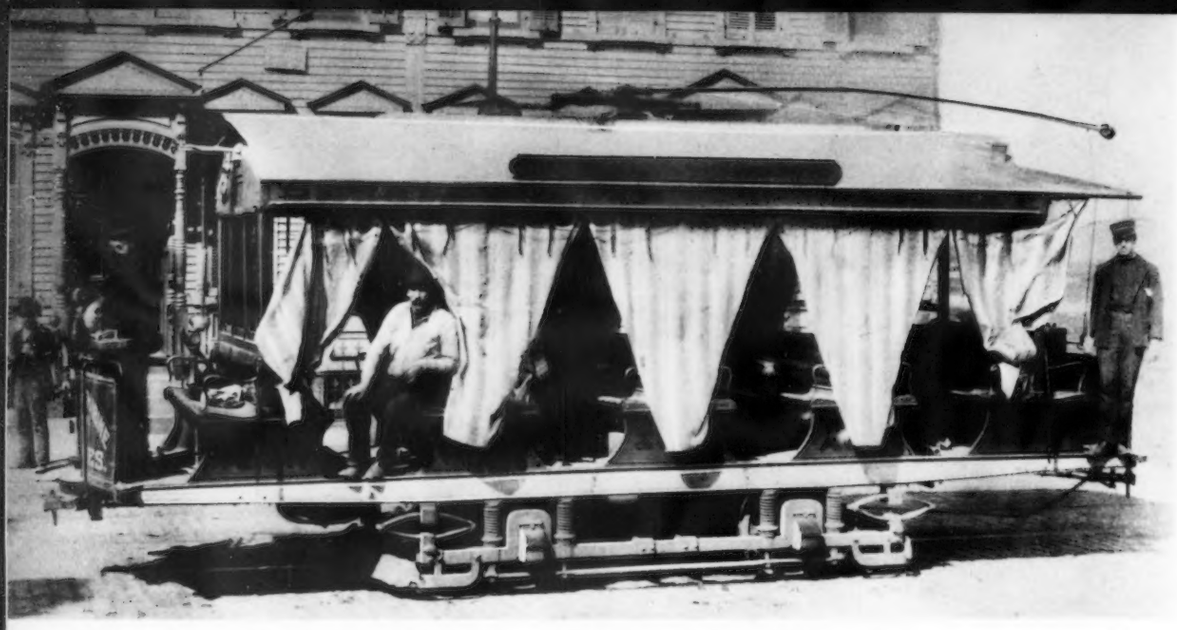
The first alternating generators were of the single phase type. Such was the apparatus that Westinghouse installed in Buffalo, through the Brush Electric Light Co. in November, 1886, for illuminating the department store of Adam, Meldrum and Anderson. This was the first commercial installation of the alternating current system. It was so successful that within two years approximately 100 alternating current plants had been installed.

With the coming of Tesla to Westinghouse in 1888 came the Tesla induction motor and the polyphase system, opening the door to the electrification of the turning wheels of industry through alternating current. The first installation of alternating current power transmission in America, however, was of the single phase type, made by Westinghouse for the Williamette Falls Electric Co. of Oregon City, Ore., in 1890. Power was transmitted as generated hydraulically at Oregon City to Portland, 14 miles distant, and transformed for lighting purposes. It was followed, almost immediately by the installation, at Telluride, Colo., of a similar high tension system in which the alternating current was applied to drive a synchronous motor. Light had thus become power.

It would serve no useful purpose, nor would it be possible in the pages available for our purposes to attempt to record, step by step, the branching and leafing whereby the

MODERN POWER. This mammoth cross compound Westinghouse turbine generator unit, whirling at 1800 r.p.m., produces 220,000 hp. It could light nearly a million homes or furnish illumination for a highway around the world.





THIS FREED THE MULE. After the electric light, the next large demand for electricity came from the street railway. Several years before Westinghouse entered the field, trolley cars had established themselves rapidly but their motors were still primitive. Westinghouse's historic No. 3 motor introduced many features of today's design.

little acorn, planted in Pittsburgh by George Westinghouse in 1886, has now become an international forest of mighty oaks. That has been well recorded elsewhere. The readers of this journal are more interested in the present than in the past; more interested in knowing what Westinghouse is today and what it may do tomorrow as a big brother of the metal-working industry than in turning the pages of recollection.

Yet this account would not be complete without a mention of some of the more significant contributions. They form an impressive roster of engineering achievement.

In 1886, introduced the alternating current system for lighting—1888, built the first meter for measuring alternating current—1891, introduced the first successful type single reduction railway motor—1893, lighted the World's Columbian Exposition—1895, built the first generators for harnessing Niagara power—1899, built the first commercial turbine generator units in the United States—1905, developed the first electric drive for the main rolls of a steel mill—1906, electrified the New York, New Haven & Hartford Railroad—1908, developed the mercury arc rectifier—1909, installed the first 140,000 volt transmission line—electrified Italian State Railways—1910, developed sectional drive for paper machines—1915, electrified the Norfolk & Western Railroad for hauling coal up heavy mountain grades — electrified Pennsylvania Railroad from Philadelphia to Paoli—1917, developed the automatic substation which assures adequate power for peak service required by railway systems—1919, installed the first 165,000 volt transmission line—1920, developed diesel-electric drive for ships and—originated radio broadcasting by establishing KDKA—1922, developed the de-ion system of arc control to increase capacities of circuit interrupting equipment—1923, supplied locomotives and equipment for electrification of Chilean State Railway—1924, developed metal alloys permitting the manufacture of smaller and more accurate instrument transformers—1925, electrified the Virginian Railway—1926, inaugurated the electric welding of buildings, thus revolutionizing many processes of building construction—developed the Grid Glow tube, or "electric eye" forerunner of the present-day industrial vacuum tube—1929, built the first diesel-electric rail car for revenue service in the United States—1931, electrified the S. S. President Coolidge, then the largest merchant ship built in America—1932, introduced the surge protected transformer—1933, built the world's fastest passenger elevators for use in Rockefeller Center, New York—1934, built locomotives and other electrical equipment for electrification of Pennsylvania Railroad between New York and Washington —1935, built two of the largest waterwheel generators in the world,



DRUDGERY



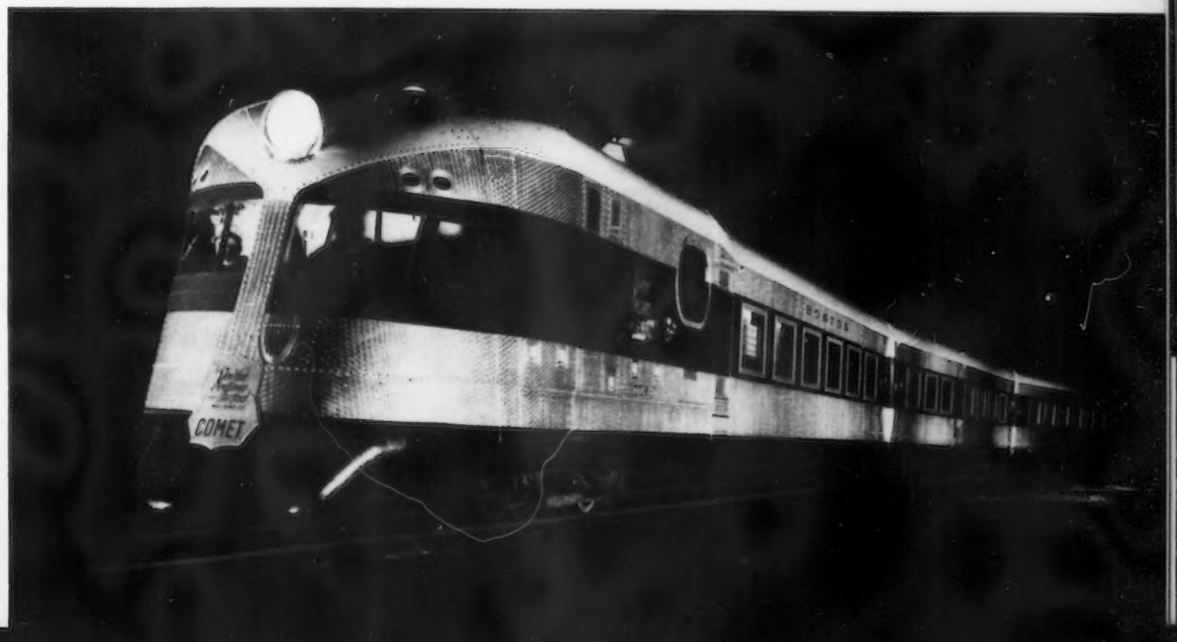
EFFICIENT ELECTRIFIED WORKSHOP for the housewife employs the principle of straight line production and is divided into three completely electrified work centers—the refrigeration and preparation center, the sink and dishwashing center, and the range and serving center.

each rated at 82,500 kva. for Boulder Dam—equipped the diesel-electric streamlined "Comet" for the New York, New Haven & Hartford Railroad—developed high intensity mercury lighting for industry and sodium lighting for highways.

Today the original little plant in Pittsburgh's alley has multiplied into 14 parent company plants and five subsidiaries scattered throughout the United States. The 200 employees have become 45,000 in a normal year; total sales in such year are about $180,000,000, considerably over a half million dollars every working day.

Products have increased from the first simple apparatus required in 1886 for the production of "wired" light to vast regiments of varied equipment marshalled under the divisions of Light, Heat, Power, Transportation, Communication and Conveniences.

Due to the wide variety of products manufactured by Westinghouse plants and to the fact that fully 80 per cent of its operations are in the "metal-working" category, the little journey through the works should be of interest to all IRON AGE readers. It would be difficult to name any operation in metal-working that could not be found practiced in some Westinghouse plant or department; equally difficult to mention a metal or a metal-working machine that is not utilized in smaller or larger degree in the making of Westinghouse products. There are perhaps 20 different companies in this country in the metal-working field with which the industrialist must be familiar to be well informed. Westinghouse is one of them. It is the function of this editorial presentation to convey to you a well-rounded picture of the organization, some of its methods of management, its manufacturing facilities and a number of its interesting metal-working operations. It is especially well for us, in these peculiar times, to reflect upon the growth that has come to industrial America through such free play of initiative and individuality aided by the plowing back into an enterprise of a liberal portion of the profits made by it. For what has made Westinghouse great has also made America great. And that is the untiring search for new and better things to make and improved ways of making them. It is the instinctive obedience of man to the great command, "Let there be light."



STREAMLINE TRANSPORTATION. The Westinghouse equipped diesel electric Comet, shuttling between Boston and Providence, covers the 44 miles in 44 min. The train has two 400-hp. diesel power plants and can reach 55 mph. from standstill in 120 sec.

Men at t



FRANK A. MERRICK, president of the company, was graduated from Lehigh in 1891 with the degree of electrical engineer. His connection with Westinghouse came about through the acquisition by that company in 1902 of the electrical branch of the Lorain Steel Co., of which he was manager and chief engineer. In 1903, Mr. Merrick was made manager of works of the Canadian Westinghouse Ltd., later becoming vice-president and general manager. During the World War, he was put in charge of rifle manufacture at the Chicopee Falls works of the company and also of developing the production of the Browning machine gun. After the War, Mr. Merrick for two years was special representative of the company in London, subsequently returning to his position in the Canadian company. In 1925, he was elected vice-president and general manager of the parent company and four years later became its president.

•



NATHANIEL G. SYMONDS, vice-president, was graduated from Stanford as an electrical engineer in 1901. From 1902 to 1915 he engaged in various activities with the Westinghouse Church Kerr Co. and with the ~~Westinghouse~~ Machine Co. In 1915 he became manager of the power division of the Chicago office of the Westinghouse Electric & Mfg. Co., becoming manager of that district office in 1921. In 1930, Mr. Symonds was elected commercial vice-president of the company with headquarters in Chicago; in 1932, he became vice-president in charge of sales activities.

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W. G. MARSHALL, Westinghouse vice-president, was born in Pittsburgh, March 17, 1888. He was graduated from Washington-Jefferson College in 1911 and from the University of Pittsburgh Law School in 1914. Mr. Marshall had a wide experience in the electrical industry before joining the Westinghouse organization. In 1915 he was manager of the adjustment department public utilities of the Philadelphia Co. in Pittsburgh. In 1926 he joined the Westinghouse company as assistant to vice-president in charge of industrial relations of the company and various activities grouped therewith. On Oct. 31, 1934, he was elected vice-president.

ROSCOE SEYBOLD, vice-president and comptroller, was graduated from Purdue University in 1907 with the degree of electrical engineer. Immediately upon graduation he entered the students engineering course of the Westinghouse Electric & Mfg. Co. at East Pittsburgh. From 1909 to 1922 he was manager of the price section of the power and railway departments. In 1922 he was appointed manager of price statistics and assistant to the general sales manager. In 1926 he became assistant to the vice-president and general manager. He was appointed comptroller in 1931. In October, 1934, he was elected a vice-president of the Westinghouse company in addition to his position as comptroller.

...the Top



RALPH KELLY, vice-president, has been with the company since 1909, in which year he was graduated from Harvard University with a B. S. degree. After taking a graduate student course at East Pittsburgh he was assigned to the general engineering department, where he remained for seven years. In 1917 he was commissioned an officer in the Navy, attached to the battleship Pennsylvania, and had charge of searchlight operations for the battle fleet. In 1922 he returned to the Westinghouse engineering department and in May, 1926, he was transferred to the St. Louis office as engineering manager. In 1930 he was made Southwestern district manager. He was transferred to Pittsburgh in 1932, as manager of the Central district.



ANDREW W. ROBERTSON, chairman of the board, was graduated from Allegheny College in 1906, having worked his way through school and having been self-supporting since the age of eleven. Four years later, he had completed a course in law at the University of Pittsburgh and was admitted to the bar. In 1913, Mr. Robertson was made attorney for the Pittsburgh Railway Co. and the Duquesne Light Co. His work in connection with the reorganization of these companies led to his appointment to the vice-presidency, later the presidency of the Philadelphia Co. In 1929, Mr. Robertson was made chairman of the Westinghouse board.



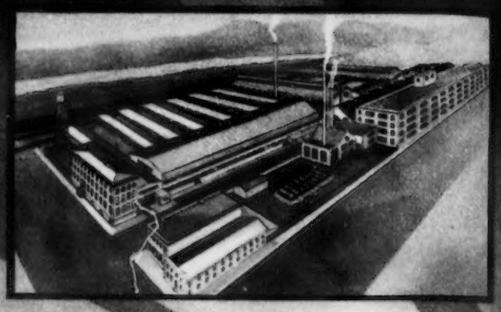
SAMUEL M. KINTNER, vice-president in charge of engineering, joined the company in 1903, after spending several years as a professor at the Western University of Pennsylvania. For eight years thereafter he was engaged in work in the research department. He left the company in 1911 to become general manager of the National Electric Signalling Co., then engaged in developing radio inventions. Later he became president of that company. Rejoining the Westinghouse company after the War, Doctor Kintner assisted in radio development and in 1922 was made manager of the research department. In 1930 he was elected assistant vice-president and in 1931 became vice-president in charge of all engineering activities.



ARTHUR E. ALLEN, who on Jan. 31, 1934, was elected vice-president in charge of the merchandising division, entered the employment of the company in 1902, at the Newark, N. J. works, and was in charge of the test department there until 1910. In 1917, he joined the Canadian Overseas Forces as a private. Later he was sent to the Canadian Officers Training Camp, was commissioned a second lieutenant in the Royal Flying Corps, and went overseas as a technical officer. After the War, Mr. Allen returned to Westinghouse in February, 1919. That same year he was promoted to manager of the New York office and in 1925 he was made general manager of the Westinghouse Lamp Co. The following year he was elected vice-president of that company, the position he occupied until his recent election.



SOUTH PHILADELPHIA --
Turbines, Gears, Diesel Engines, Etc.

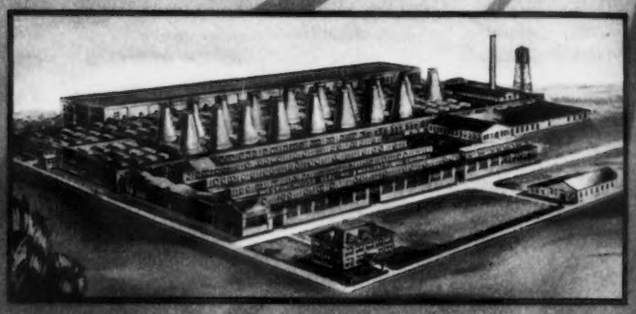


NUTTALL WORKS, PITTSBURGH -- Gears, Etc.



EAST PITTSBURGH WORKS --





DERRY, PA. -- Insulators



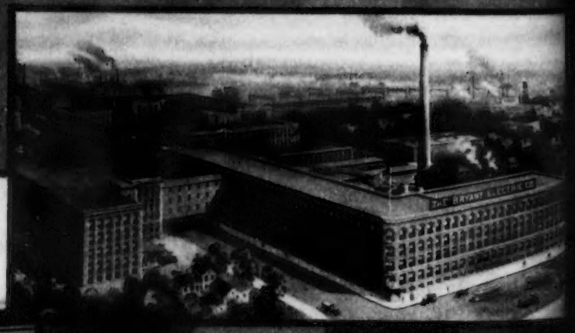


NEWARK, N.J. -- Meters, Instruments



RESEARCH LA

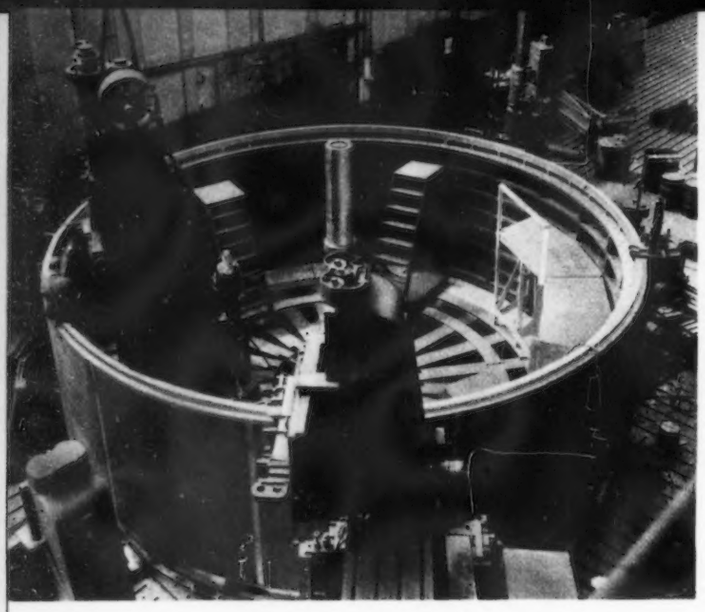






CONN. -- W


TRAFFORD WORKS, TRAFFORD, PA. -- Micarta, and Foundry
EAST SPRINGFIELD, MASS. --
Small Motors, Refrigerator Units, Etc.
Motors, Generators, Etc.
BLOOMFIELD, N. J. -- Lamps
ATTICA, N.Y. -- Stokers
TRENTON, N.J. -- Lamps
EMERYVILLE, CAL. -- Insulators



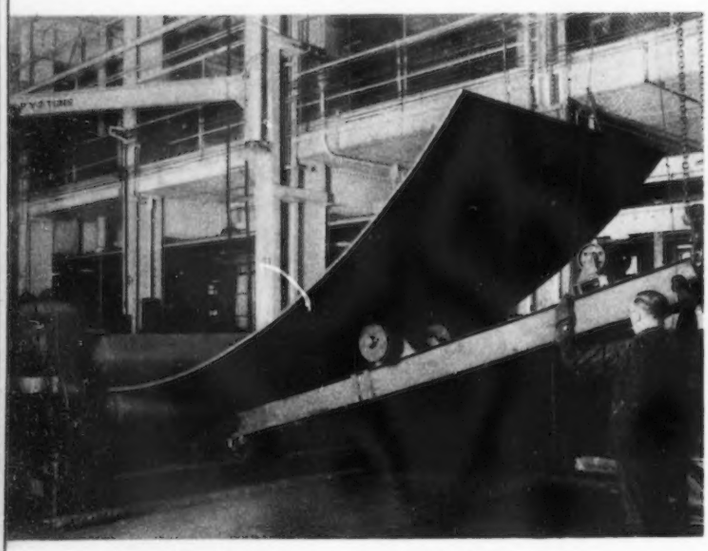
Bringing the machine to the work. The 32-ft. valve is stationary and the machine tool is mounted inside on a turntable.

• • •



Copper strip, 8½ miles of it, weighing 32,000 lb. being wound on rotor of single-shaft turbo generator

• • •



Rolling a 32-ft. diameter plate segment for Boulder Dam intake gates.

• • •

East Pitt

LARGE-SCALE and extremely diverse production characterize the East Pittsburgh works of the Westinghouse Electric & Mfg. Co.

The largeness of scale embraces the plant itself; its major manufacturing divisions; and the large machinery built, some of it gigantic. The plant occupies an area of 185 acres, with used floor space of some 4,275,000 sq. ft. One of the three major manufacturing shops alone has floor space of 923,000 sq. ft.; another, with 714,000 sq. ft., has a straightaway manufacturing aisle that is 1700 ft. long. Unusually large machine tools—a 128-in. lathe and a 40-ft. boring mill, for example—are suggestive of the huge work produced here.

Manufacture, however, also includes very small apparatus. And, in type it ranges between the extremes of tailor-made building of a single machine never perhaps to be exactly duplicated, and conveyorized, progressive, high-production of standard medium and small-size products in active demand. Wide diversity of product, from small motor controls to large switchgear and water-wheel generators weighing 1000 tons, also exists, as well as extensive range in type and size of some products. In motors, for example, there are more than 30,000 distinct types and sizes.

Center of a Circle of 14 Plants

The East Pittsburgh works is the center of a circle of some 14 other Westinghouse manufacturing plants. It is here that the general works manager and his staff are located, and it is from here that general manufacturing policies and methods emanate.

The consulting staff, which has advisory connection with all plants, consists of five or more groups. These include General Works Engineering, devoted to maintenance of buildings, etc.; Equipment Inspection and Testing, an advisory and coordinating group devoted to selection, layout, maintenance, etc.; Time Study; and a Director of Production, who establishes general production order procedure. There is also a superintendent of employment, and a manager of employee training.

Touching all manufacturing plants, but within the scope of the engineering department, is the materials and process engineering group engaged in coordinating material requirements with the aim of keeping grades and sizes within economic limits.

Management of each of the 15 plants heads up in a local general superintendent. At East Pittsburgh this local management extends to each of the three major divisions, namely, the generating apparatus,

Pittsburgh Works

motor and motor controls, and switchgear. It also extends to the feeder groups that supply materials and semi-finished parts to those major divisions and to some extent to other Westinghouse works.

With this brief picture of the East Pittsburgh set-up as a whole, we will pass on to consideration of the three immense manufacturing divisions, and of the smaller, but important, feeder units.

Generator Division the Largest Unit

THE largest single unit at East Pittsburgh is the generator division, with manufacturing floor space of 923,000 sq. ft. Employees at present number 1500. One section is 1300 ft. long and 100 ft. wide, and another is 1200 ft. long and 80 ft. wide.

Machines produced embrace all types of motors and generators as well as mercury arc rectifiers and industrial heating equipment. The a.c. generators include turbine generators up to 185,000 k.v.a., vertical waterwheel generators up to 82,500 k.v.a., and slow speed direct connected Diesel engine driven generators. The a.c. motors include synchronous and induction types for all kinds of industrial service. The d.c. machines include motors, generators and rotary converters, the largest of which is an 8000-hp. steel mill motor at 40-80 r.p.m.

Builds Gigantic Machines

The large size of the component parts handled in this division may be illustrated by a number of recent machines.

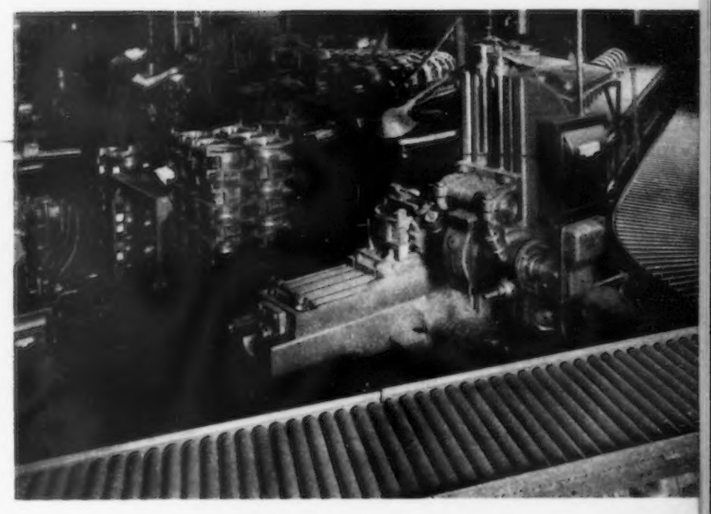
The largest waterwheel generators built by the company were for the generating station at Boulder Dam. The diameter over the inclosing housing was 40 ft., and the height above the floor line was 33 ft. The largest part was the rotor, which was approximately 25 ft. in diameter and 8 ft. wide. It weighed 565 tons. The rotor included a 35-ton cast-steel spider and 320 tons of rim punchings. Each pole and coil weighed 4 tons. The shaft weighed more than 50 tons.

One of the most recent frequency changer MG sets was the hydrogen cooled 60,000-k.v.a. unit for the City of Los Angeles, the largest machine of this type ever built. It is 16 ft. in diameter and 53 ft. long. The largest rotor for the unit is 9½ ft. in diameter and 25 ft. over the shaft. The enclosing shell was made in six main sections with two end



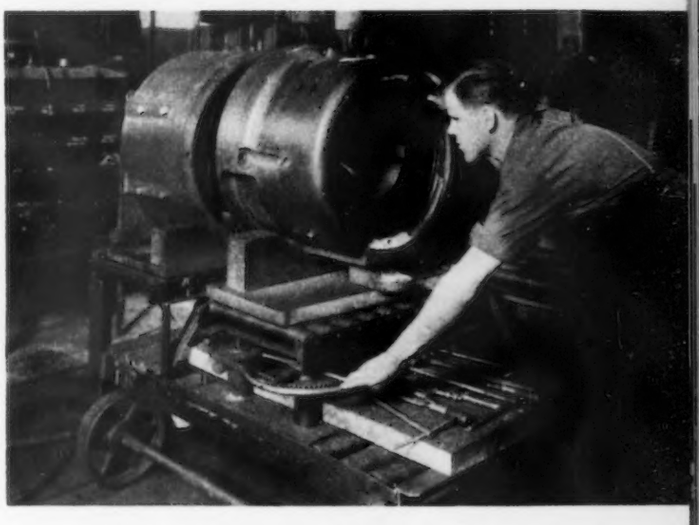
Water wheel generator frame mounted on turntable and rotated under automatic welder for welding a continuous seam.

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Motor frame production is in a straight line. Operations include milling of feet, boring and facing of frame, and drilling.

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Elevating roller table used to facilitate lining up of two units in progressive assembly of new Flex Arc welding sets.

covers. These sections were bolted together to make a single gas-tight unit. The total weight of the unit is approximately 600 tons.

Accurate Work on Large Rotors

The most recent large turbine-driven generator was for the Richmond Station of the Philadelphia Electric Co. and is rated at 185,000 k.v.a., 1800 r.p.m.

The alloy steel rotor was 5 ft. in diameter and 35 ft. long from the coupling to extreme end of the shaft. The completed rotor weighed 125 tons. The main parts of the rotor consisted of forged steel plates 8 in. thick and 5 ft. in diameter. The end sections are solid steel forgings.

Rotors of this type require a large amount of very accurate machine work. For example, the rotor plates are finished all over in a vertical boring mill, the sides being held parallel within a tolerance of 0.001 in. The 6-in. bolt holes are drilled and reamed with such accuracy that when the plates are assembled the bolts will slip into place with the plates reamed 0.006 in. larger than the bolt.

Floor Mill for 40-Ft. Parts

Manufacture of large machines of the type described requires very large machine tools. These must be of a flexible nature, and many of them are portable so that the tools can be moved to the piece to be machined.

Included in the large special tools is a floor mill used to bore and face frames up to 40 ft. in diameter. The frame is bolted down and the machine tool rotates on a table in the center. Another interesting machine tool is a horizontal drilling machine built like a post mill and permanently mounted inside of a rotating indexing table. This machine is used to drill the holes in d.c. motor and generator frames.

Exterior Fabricating Shop

An outstanding section of the generator division is the 104-ft. x 845-ft. shop in which are fabricated frames, spiders, brackets, end bells, etc. The very large Boulder Dam gates were built here. Circuit breaker and transformer tanks up to 14 ft. in diameter and 22 ft. high are also made.

Equipment includes rolls, plate benders, plate planers, large flanging presses, flame cutting and welding machines of various kinds and sizes, and electric car-type furnaces for the stress relieving of welded structures.

A set of vertical bending rolls is installed for bending flat steel plates up to 10 in. thick and 33 in. wide. It is oil-pressure driven and operated from a pulpit. In operation the heated slab enters a trunnion-mounted vertical crimping unit which puts a radius on the first few inches of the slab. The slab is then tilted and conveyed on rollers to the bending rolls which are capable of exerting pressure up to 1250 tons. In the same section there is a vertical roll for rolling bar stock on edge. It will roll cold bars up to 2½ x 12 in. on a 190-in. diameter.

The welding section is equipped with automatic, semi-automatic and manually operated arc-welding equipment. Special fixtures and welding manipulators are used to facilitate the welding of very large work. The welding is done by more than 100 operators trained in the Westinghouse welding school.

Tools Brought to the Work

The generator division includes several assembly sections. One of these is equipped with T-slot floor plates that assure accurate leveling and clamping of large work and also permit positioning of machine tools for work on parts that are too large to be moved to stationary equipment. A turntable with a swing of about 40 ft. is used for boring and turning or as an indexing table with portable tools placed around it. In connection with the Boulder Dam generator rotor, this table carried a fabricated member weighing about 200 tons. Two post mills were located on the outside of the rotor to mill the long vertical slots in the ends of the arms. The table was used for indexing these slots. At the same time a portable radial drill was mounted on the rotor itself for drilling bolt holes in the spider.

The generator division also maintains a very large department devoted to the building of all types of coils—including field coils as well as armature coils for both rotating and stationary armatures.

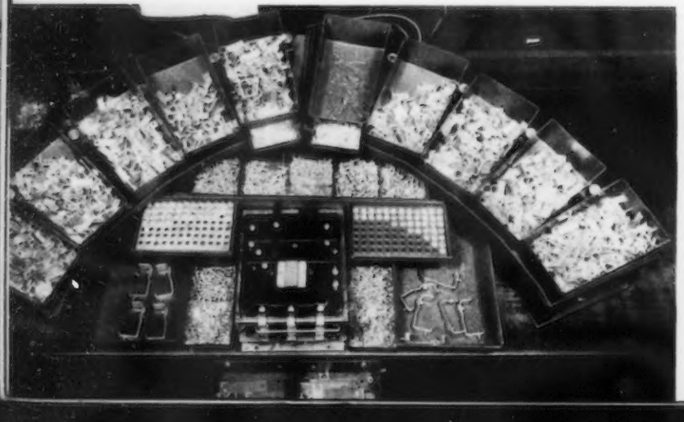
Industrial Motor and Motor Control Division

ANOTHER immense manufacturing division is that devoted to industrial motors and motor controls. Floor space occupied by the motor department is 283,000 sq. ft., and by the control department, 161,000 sq. ft., a total of 444,000 sq. ft. Employees in the first range from 1200 to 1500 and in the control section, from 500 to 600.

Production in both is of continuous type within a number of separate, conveyorized machining and assembling units. All major pro-

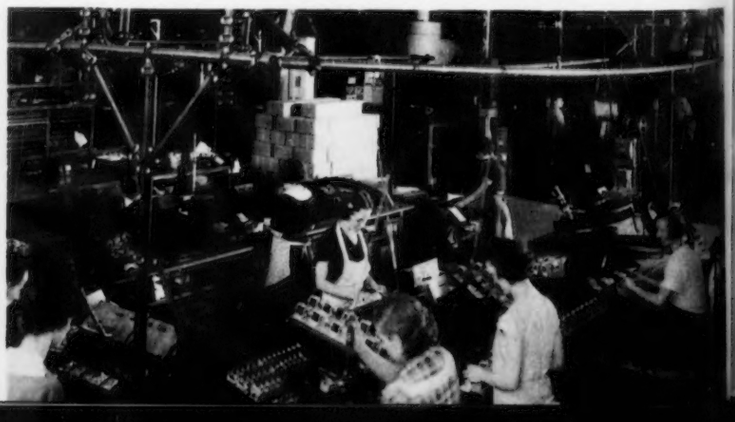
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Production layout for small motor starter parts arranged to eliminate lost motion during assembly.



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Line starters for induction motors are produced in a straight line. Special features facilitate assembly.



duction centers of each has its own shop office, with its separate scheduling, time and motion study and costing units, all reporting to a central production office of the division. As elsewhere at East Pittsburgh, all operations are motion, as well as time, studied, and quick-acting assembling and machining fixtures in large number are provided, as well as benches, chairs and other equipment designed not only to facilitate production but to minimize operator fatigue.

Flex-Arc Welder Line Highly Synchronized

One of the most recent and highly organized sub-production groups of the motor division is that devoted to the manufacture of the new Flex-Arc welder. Frames, supplied by the company's Trafford foundry, are first bored, faced and drilled. Poles, switches, etc., are assembled at the next station; then connections and leakage plates are added, all materials and sub-assemblies being conveniently at hand in racks. The Flex-Arcs next go by conveyor to a station where the rotating element and brackets are assembled, progressively, to the frame.

The completely assembled welding sets end up at inspection benches, where they are checked for completeness of parts, finish, etc., and then tested in actual operation by welding with standard electrodes and at various current settings. Adding of nameplates and spray painting follows—all on the one continuous conveyor line.

High Production and "Short Order" Layouts for Motor Parts

Manufacture of motors accounts for the largest activity of this division. High-production set-ups are numerous, and continuous-type group machining layouts, with machine tools arranged to permit skilled operators to efficiently attend a series of different machines is a feature of several sub-production sections. One example is in machining of a.-c. motor frames. The five or six machine tools for this work are located in one conveyorized group, and attended by several operators. Frames with special features are machined on a supplementary, smaller group of machine tools, another feature of the department, designed to avoid breaking up the continuity of operations on standard large-lot orders.

Machining of end brackets for all sizes of a.-c. and d.-c. motors is also continuous, and a "short order" group, for keeping of specials out of the regular production channels, is maintained here. Bores to receive ball bearings are held to a tolerance of 0.0005 in.; in this case the finish boring is done on separate horizontal precision boring machines using cemented-carbide tools.

Sleeve Bearing Bores Held to 0.0005 In.

Sleeve bearings of all sizes are made in a department equipped for straight-line production. Cold rolled steel shells, furnished rough machined by the automatic screw machine feeder department, are pickled and tinned and then babbitt lined by a centrifugal process. The piece then proceeds through milling, rough boring, multiple-tool turning, high-speed finish boring, finish grinding to a tolerance of 0.0005 in., and finally, oil grooving.

Motor Shafts Machined Progressively

Motor shafts regardless of size are machined in one department. They are usually of axle steel, and range in size from ⅞ to 10 in. in diameter and up to 5 ft. in length.

Machining is progressive. The shafts are first rough turned and spotted; the keyway is then milled and the shaft rough and finish ground. Body and pulley keyways are multiple milled, about five shafts at a time, in a machine equipped with a special air-clamped V-block fixture. Grinding on hydraulic machine with electrical stops for controlling diameter, follows. Bearing fits are held to 0.0005 in., many of them to 0.0003 in.

Rotors Built Up by Die Casting

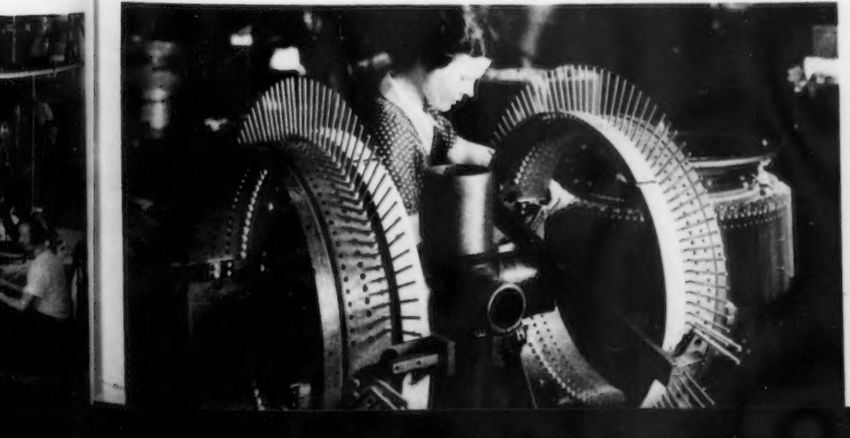
Interesting equipment in the rotor manufacturing section includes a die casting layout. Bundles of rotor punchings are put in special aluminum die casting machines where the rotor windings, blades and end ring are cast under high pressure into the rotor in one rapid operation. From the die casting machines the rotors are routed in three different production lines, according to size. Operations in each include keywaying of the rotor, pressing in of the shaft and then checking of the entire assembly between lathe centers; in this they are required to run true within 0.001 in. The rotors are then lathe turned to a tolerance of plus or minus 0.001 in. and are tack welded to their shaft to prevent lateral movement of core and shaft. Balancing on electro-dynamic balancing machines, and then inspection follow.

Motor Controls Incorporate Intricate Assemblies

THE motor control subdivision of the industrial motor division, with its manufacture of apparatus having many individual parts—in some cases several hundred — furnishes another example of well engineered production planning and assembly facilities. Here are manufactured controls for a wide line of motors including large and small

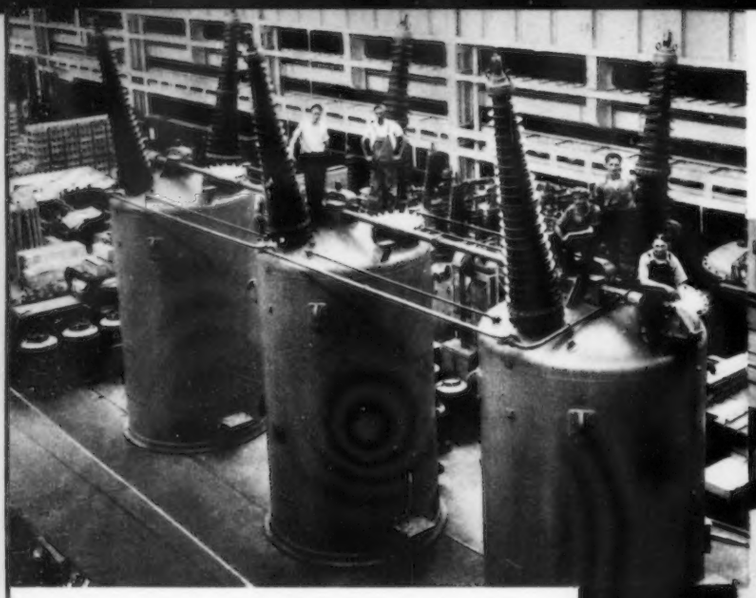
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Special fixture for holding new railway control accelerators for rapid assembly of the many small parts.



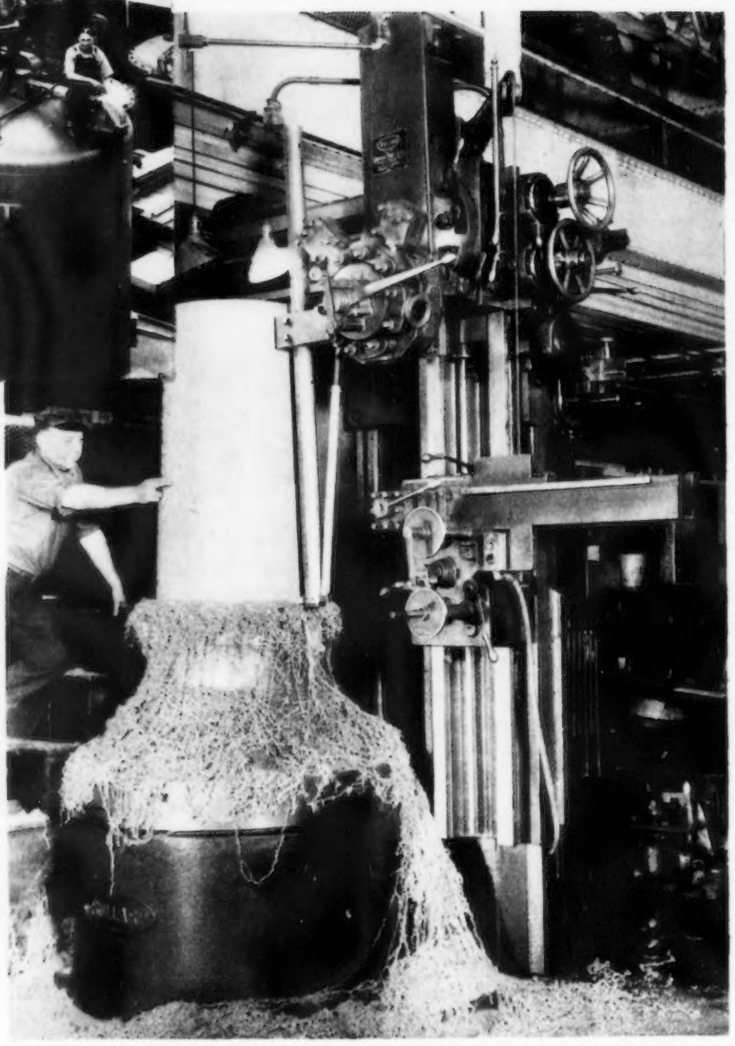
Rotor and stator punching layout arranged with conveyors so that punchings travel progressively, and are finally delivered to an automatic stacker.





Three 1000-amp., 220,000-volt oil circuit breakers built at the Westinghouse East Pittsburgh works for the Philadelphia Electric Co.

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This condenser-type Micarta bushing for a 287,500 volt circuit breaker is machined inside and outside on a vertical turret lather with an unusually high housing. Cemented-carbide tools are employed.

industrial, electric locomotive, street railway, electric motor bus, steel mill, paper mill, mine and others.

It is made up of six assembly sections with four machining sections located opposite. There is also a large sheet metal shop, a separate testing department, an experimental department, and a number of feeder groups, including a large coil winding section.

There are more than 75 assembly benches. All assembly, including details, is in one direction until completed. Finished material comes to each assembly group from storerooms according to definite schedules and is placed in storage racks. Belt conveyors carry materials and sub-assemblies down in each bench; in some cases, notably the De-Ion Linestarters, the finished apparatus is conveyed directly into shipping containers.

Foot-Operated Fixtures Employed

Wherever possible, jigs and fixtures are of foot-operated type. At various assembly benches are to be seen drill presses, riveting and other machines mounted on casters to permit taking the machine to the job. All automatic screw drivers, wrenches and other portable electric hand tools are suspended on a pipe rail, current being furnished by an overhead trolley extending along each bench.

Each of the four main assembling sections has its own machining group equipped with 50 or more machine tools. In these, the millers, lathes, grinders, etc., are grouped together to permit one operator to run more than one machine. Machine tools range from small to very large, and wherever possible they are equipped with cam-actuated, quick-loading fixtures. Castings and other parts come to each machining group on belt and roller conveyors from the storeroom; after machining they go back to the storeroom by a similar conveyor system. Large parts, however, are trucked.

The sheet metal shop, a sizeable unit of the control department, is devoted to the fabrication of frames, some of them very large, and of boxes, guards and the like. An automatic painting layout for boxes and other control inclosures is outstanding. It extends through three floors, on the first of which the boxes are received, then conveyed upward through washing, drying, dip painting units and a baking heater, ending up by conveyors in a storeroom located in a balcony.

Switchgear a Large Division

WITH manufacturing floor space of about 714,000 sq. ft., the switchgear division with its auxiliary feeder units is the second largest at East Pittsburgh. Furthermore, one of its production sections is of record length, namely 1700 ft. Employees in the main and feeder sections range in number from 900 to 1200.

The major product is switching equipment or current interrupting

protective devices for central station and industrial electrical distribution systems. These range in size from small De-ion air circuit breakers to the 287.5 kw. oil circuit breaker for Boulder Dam. Control desks and switchboards which control the larger current interrupting devices are completely fabricated, assembled and tested, except for the instruments. Resistances and rheostats for assembly into these switching and other units are also made, as well as overhead line material for electric railways.

Feeder units include a large screw machine department and separate units for the manufacture of springs, molded plastics, cotton covered and enameled wire, and a processing department equipped to do all kinds of plating. These serve all divisions and to some extent other Westinghouse plants.

Most Products "Tailor Made"

Except for 225 and 600 amp. De-ion circuit breakers and a few sub-assemblies used in several types of apparatus, all production is of intermittent type, almost every major unit being for the most part "tailor made." In addition, each separate product comprises a large number of individual parts—many of them very small—which makes the scheduling and manufacture somewhat more complicated than usual.

Machining departments are located adjacent to one or more groups of assembly benches, which they serve. Machine tools are grouped by classes, although operators are trained to handle more than one type, to permit flexible changeover when necessary. In all, the switchgear division has 34 such machining groups, 58 assembly and 26 service groups.

Accuracy Required in Circuit Breaker Parts

Many parts have to be held to close accuracy. In the 225 amp. circuit breakers, for example, the very small roller and shaft of the trip bar, nitrided and highly polished, have to be held to 0.001 in. or better to assure proper functioning of this important element. Production of the main frame of the 600 De-ion circuit breaker involves a precise job of permanent molding and fabricating because of the exact location and alinement of the various holes, alinement within 0.001 to 0.002 in. being required. Fingers for these circuit breakers are contour milled to close limits.

Another example of accurate manufacture is the fly ball assembly of the type CM motor-operated network protector mechanism. The housing, a permanent mold brass casting, is required to be held in very close alinement to assure operation of the device within prescribed electrical tolerances. Machining tolerances must be held within 0.0005 to 0.001 in. on this production work.

Oil Circuit Breaker Section Is 1700 Ft. Long

One of the most interesting and extensive machining, assembly and testing layouts of the entire East Pittsburgh works is the section of the switchgear division devoted to the making of oil circuit breakers of k and larger capacity and fabricated sheet metal enclosures, including control desks. It is this section that has the 1700 ft. x 70 ft. manufacturing aisle.

The machine shop that serves this department is equipped with large machine tools of all types, grouped by classes and served by individual jib cranes. Welded steel jigs and fixtures are provided even where quantities are limited, their purpose is accuracy as well as rapid machining. A wide diversity of materials is machined, including welded combinations of magnetic and non-magnetic steels, which present a particularly difficult machining problem, requiring tools made from a special tool steel.

Interesting machining set-ups include taper turning of circuit breaker static shields made from Micarta. For the Boulder Dam circuit breakers, these shields in the rough were 72 in. long, 18 in. inside diameter and 25 in. outside diameter. After machining they were 69 in. long and tapered for the full length, inside and outside; the finished piece was 20⅛ in. x 21⅝ in. and 23 in. x 25⅛ in. on the inside and outside diameters, respectively. Machining is on a vertical turret lathe with an unusually high housing; 49 hr. of continuous operation is required to complete the piece. Cemented-carbide tools are employed.

The machine shop part of this extensive section includes a sizeable flame cutting, welding and brazing shop, which serves this and to some extent other divisions.

A large sheet-metal shop is maintained for the construction of oil circuit breaker frames, resistance frames, network protector tanks and switchgear structures. An interesting sub-section adjacent is de-



Molding set-up at the Trafford foundry. The swinging sandslinger serves four machines, and from 180 to 200 flasks are handled per 8-hr. shift.

voted to welded fabrication of network protectors and welding of cubicles and trucks of metal-clad switching equipment.

Large Apparatus Built

Large units recently put through this section include large apparatus for the 1,000,000 kw. T. V. A. Wheeler Dam project. The switchgear consists of 13.8 kw., 2000-amp. circuit breakers, lightning arresters, capacitors, instrument transformer, copper bus and motor-operated lifting device. The sheet steel frame that houses these elements is 23 ft. high, 17 ft. wide and 15 ft. deep.

Other large units include the main control desk, with instruments, indicating lights, control switches, etc.—a very large unit—for two 3050 kva. power generators, an auxiliary control desk for Boulder Dam, and a number of intricate switchboards having from eight to 48 steel panels.

Screw Machine Feeder Units

Outstanding feeder units under the jurisdiction of this division are the screw machine and the processing, or plating departments. The former comprises two sections, one automatic and the other hand screw machine. In each there is a machining group for second operations, such as drilling, milling, etc., and an interesting feature is a subgroup fully equipped for first and second operations on lots ranging from one to five pieces to separate such orders from the large lots of the regular production equipment.

Castings and Stampings Supplied by Separate Feeder Division

ANOTHER large feeder group comprises a gray iron foundry, an alloy casting foundry, a large metal stamping shop, and a copper mill—all at separate but near-by locations.

The foundry, located at Trafford, Pa., some seven miles distant, is connected with East Pittsburgh by a broad gage railroad operated by the company. Gray iron and alloy iron castings ranging from a fraction of a pound to several tons are made. Employees, including those in the large pattern shop, range from 550 to 600. Production of castings at present is at the rate of 1,500,000 lb. monthly.

Foundry Workers X-Rayed

Melting equipment includes four large cupolas, two air furnaces and one 750-lb. electric furnace. Automatic sand handling, including sand cutting, is employed and for some standard castings of medium size, conveyerized, continuous molding, pouring and shake-out groups are provided. Dust prevention, by ventilated shake-out stations and a general exhaust system, has been given considerable attention. The medical department of this Trafford plant includes equipment for periodical X-raying of all foundry workers; all new applicants for employment in the foundry are subject to the same X-ray examination.

Located at Linhart, Pa., the alloy casting foundry is equipped to make bronze, brass, copper, aluminum and other non-ferrous castings ranging from a few ounces to 10 tons in weight. Present production is approximately 200,000 lb. monthly and number of employees averages about 160.

Maintains Copper Mill

In addition, and also located separately, is a copper mill equipped to supply rolled and drawn copper, such as rods, ribbons, commutator segments and other forms. Capacity is in excess of 1,000,000 lb. a month. A refinery that runs whenever sufficient scrap accumulates is maintained in the copper mill, the refined material being poured into 4 in. x 4 in. x 4 ft. wire bars.

Large Metal Stamping Plant

A large metal stamping plant that is equipped with more than 600 power presses and machine tools and gives employment to 500 to 600 persons is part of the same feeder group. The sheet steel laminations for all large power equipment are punched and annealed in this department.

High production layouts include one for making primary and secondary motor laminations. Laminations in active demand are made complete in one operation, with compound dies; small-lot work is done in a series of progressive operations in presses equipped with universal stop gages for accurate positioning of the work under the dies. Stator cores are manufactured complete, ready for pressing into motor frames, by a group of machines that blank the square "cookies," pierce, and trim and punch out the center. The centers are used for making rotor punchings in a similar operation layout.

High-Production Set-Up for Control Cabinets

There is also a conveyerized, high-production set-up for making control cabinets. Manufacture is progressive, starting with slitting of the stock. Operations include blanking, drawing, trimming, bending in brake presses, notching, spot welding, and final assembling.

Steel and brass washers are manufactured by a group of automatic machines attended by one operator. Material sheared to width is blanked in multiples of 12 to 25 at a time in an automatic press. From the back of the press the washers pass under a power-driven flattening roll and are then fed automatically into a tumbling barrel for the removal of burs.

The second floor of the press shop is devoted for the most part to the production of small details, about 150,000 such miscellaneous items passing through this section monthly.

Plant Devoted to Renewal Parts

AN interesting unit of the Westinghouse company is the plant devoted to the manufacture of repair and renewal parts. It was erected in 1921 at Homewood, Pa., some 8 miles from East Pittsburgh. Manufacturing floor space is some 200,000 sq. ft. and the number of employees ranges from 450 to 600.

Parts manufactured here are chiefly those of non-current design, for rotating equipment and controls used in the industrial, transportation and central station fields. When any of the parts of such apparatus made at other Westinghouse works become obsolete, all drawings, patterns and tooling are transferred to the Homewood works. The entire organization of this plant is based on "service" — the quickest possible replacement of parts to users of Westinghouse apparatus.

South Philadelphia Works



Every turbine blade from 1½ to 40 in. is carefully checked in box gages.

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LOCATED on land which was settled by the first white men to arrive in the Delaware Valley and later, in 1638, called New Sweden, the Westinghouse South Philadelphia works occupies an "inside of the fence" area of 82 acres. Total land owned at this location, however, is about 475 acres, with a frontage of 4500 ft. on the Delaware River.

Manufacturing floor space now being used is in the neighborhood of 539,000 sq. ft. Engaged at capacity, the plant employs 6000 men.

Steam turbines and related apparatus, such as condensers, marine reduction gearing, pumps, air ejectors, and blowers are the major products. Heat exchangers and Diesel-electric engines are also built.

The turbines range from ½ kw. single-wheel machines for headlighting on locomotives, etc., to the 165,000 kw. two-cylinder compound unit completed last year for the Richmond station of the Philadelphia Electric Co. This gigantic steam turbine, weighing more than 700 tons, is credited with being one of the four largest two-cylinder, single shaft machines ever built, developing power enough to furnish all electrical service required in a city of more than 500,000 population.

Shop problems involved in building such large turbines are reflected from the following facts: Initial steam pressure is about 375 lb. and temperature of the steam is 875 deg. F. Because of the high temperature, some of the turbine parts are a dull red heat when operating at capacity. There is a total of 15,000 blades, the longest of which is 38 in. Operating at a normal shaft speed of 1800 r.p.m., the tips of these blades travel at a speed of 13 miles a minute. The complete rotating element, which weighs 237½ tons, had to be balanced so accurately that vertical or lateral movement in its bearings was held within a few thousandths of an inch.

Heavy Machine Shop a Large Unit

The heavy machine shop is the largest division of the plant. It is made up of four buildings, each of which is 700 ft. long by 128 ft. wide, and contains the turbine reduction gearing and condenser manufacturing departments, the main welding shop, the erecting shop and the testing department.

Rotors and casings are the two largest components of steam turbines. Rotors range in weight from 2 to 60 tons, and in length from 4 to 21 ft. and more. With the blading in place, the largest rotors will have an overall diameter of some 15 ft. They are solid forgings, and in the largest sizes have one or more blade disks shrunk on.

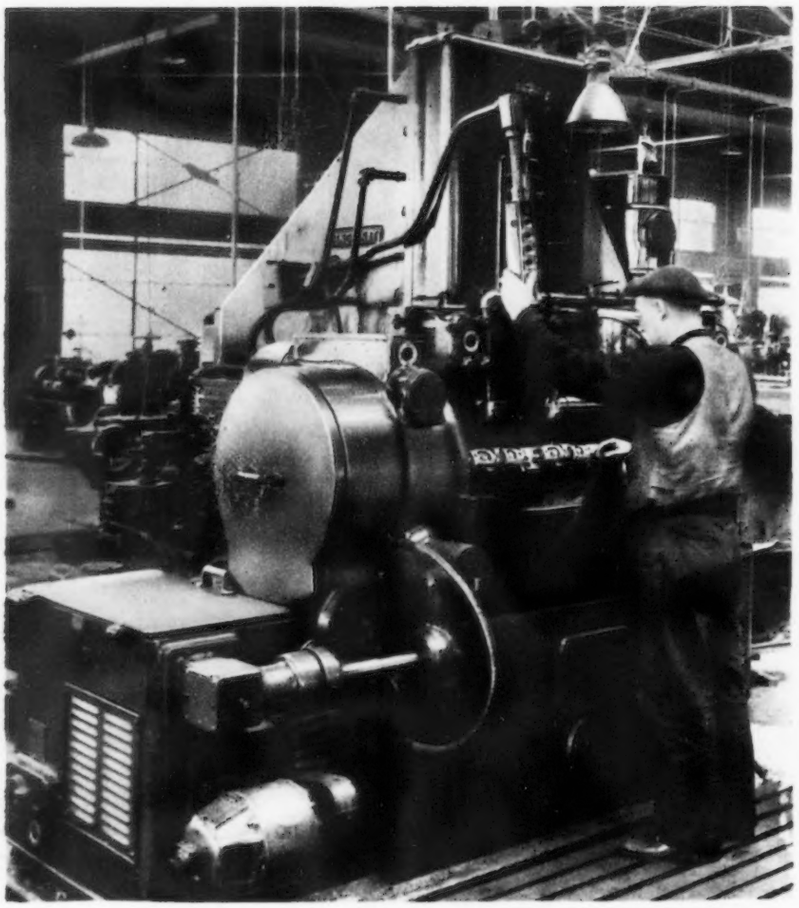
Rotors come to the heavy machine shop rough turned. They are then finish turned in a large lathe and all blade grooving is finished. There are as many as 30 grooves in some types, and close accuracy is required in finishing them. All dimensions are taken from one point; from this point the overall spacing has to be accurate to plus or minus 0.010 in. in 12 ft. 2 in. With the correct spacing, the dimensions of each groove must be held to plus or minus 0.001 in.

Rotors Undergo Seasoning

Ends of the rotor are machined last in lathes, which range from 48 to 160-184 in. swing, and the journals of the larger rotors are lead lapped in the same lathe set-up.

After the blades are installed, the rotor is returned to the lathe, where the blades are "tipped" to a template, by a grinding attachment in the toolpost, to assure uniform height. Dynamic balancing on equipment capable of taking parts weighing 200 tons follows.

Rotors for 20,000 kw. and larger turbines are then given a "seasoning." In this they are mounted in a special casing and driven by another turbine. The spindle is first heated to about 900 deg. F.—over a period of 8 hr.—while slowly rotating—and soaked at that temperature for 6 or 8 hr., the object being to relieve any internal stresses set-up by forging or machining. This is followed by a 20 per cent overspeed test in the same casing, after which the temperature is lowered as slowly as it was applied. The rotor is then put back in the lathe, where the blades are reground to correct any stretching resulting from the overspeed test. It is then rechecked for balance.



Ports in impulse blades are accurately milled on this high-production drum type machine.

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Turbine Casings

Casings, or cylinders, of the larger machines are designed in halves, namely high pressure and low pressure sections, respectively, with covers for each. On some very large jobs, notably the 165,000 kw. turbine, the low pressure casing is made in three sections, the outer ones weighing about 25 tons and the middle section about 90 tons, while covers for the end sections weighed 25 tons and for the middle section, 75 tons. Boring and grooving of the casing is held to the same limits of accuracy as the rotor. Joints are machined on planers and later scraped to a perfect metal-to-metal fit, no gaskets being permissible in this component of steam turbines.

High-Speed Gears Held to Close Tolerances

Making of high-speed reduction gearing has long been an important activity of the South Philadelphia works. These gear sets are of double reduction type, double helical, and in power transmitted they range from 35 to 35,000 hp. The smallest pinions measure 1½ in. in diameter and the largest gear wheels about 140 in. in diameter. Face widths range up to 45 in. Weight of gear wheels is in some cases as high as 35 tons.

Close tolerances are noteworthy—almost spectacular, considering the massive components. Tooth spacing, for example, is held to plus or minus 0.0002 in. or less; permissible variation in tooth shape is 0.0003 in. (or plus and minus, 0.00015 in.); and lead, or helix angle is held to 0.0006 in. per ft.

Production of gears to this accuracy starts with careful checking and adjustment of the hobbing machines and hobs, done by a member of the engineering department. Wear and seasoning and settling of the machines are corrected at regular intervals, this being particularly necessary on large gears when manufacturing high-speed gearing. Hobs are carefully checked for spacing of faces, lead, run-out and tooth profile. On large gear wheels the hobbing machine is inclosed in a wooden, heat-insulated frame to assure the necessary constant temperature.

17,000 Holes Drilled in Some Condenser Tube Sheets

Single-pass, radial flow type condensers with cooling surface of 500 to 113,000 sq. ft. and measuring from 24 in. diameter x 14 ft. to 43 ft. x 29 ft. x 32 ft. overall, and weighing from 3500 to 740,000 lb. are made. Related products, which like the condenser are now fabricated of welded steel, include feed water heaters, evaporators, evaporator condensers, bearing oil coolers, generator air coolers, and a number of condenser auxiliaries.

Plates for the condenser shells range from ¼ to 1 in. in thickness. They are flame cut, rolled to shape, and then welded. Machining includes a great deal of drilling, counterboring and tapping of the Muntz metal tube sheets, some 17,000 holes, ⅞ in. in diameter being required in each tube sheet of some of these condensers.

Feeder departments serving the heavy machine shop include a "small" machine shop and an automatic screw machine department. The former supplies the larger shop with governors, glands, port rings and other turbine parts. It also manufactures small steam turbines up to 600 or 700 kw.

Turbine Blade Production

One of the most interesting departments is that devoted to the manufacture of turbine blading. This is in a separate building and occupies manufacturing floor space of 146,150 sq. ft. Equipment is laid out for straight-line production, either for stock or for order.

Turbine blading is of two main types, namely reaction and impulse, the latter machined from bar stock. From 5000 to 15,000 blades are required for a modern steam turbine of average and large size, and some of the larger blades require 30 or more operations. Most operations are done on milling machines with formed cutters.

Within the blade manufacturing department, there are three separate production sections devoted respectively to the making of forged, rolled, and machined blades. The forging and rolling are done in well-equipped departments of the blade shop.

Reaction Rolled Blade Processing

Reaction blades formed by rolling go first to a battery of machines for upsetting of the root. On larger stainless steel blades, the upsetting is done hot; on smaller stainless steel and on copper blades it is done cold. Punch presses then trim off the flash and size the hook, except the hook of stainless steel blades over ¾ in. in section. Punching of lashing wire holes and cutting of blades to length are also done on power presses. Lashing wire holes of stainless steel blades, however, are drilled.

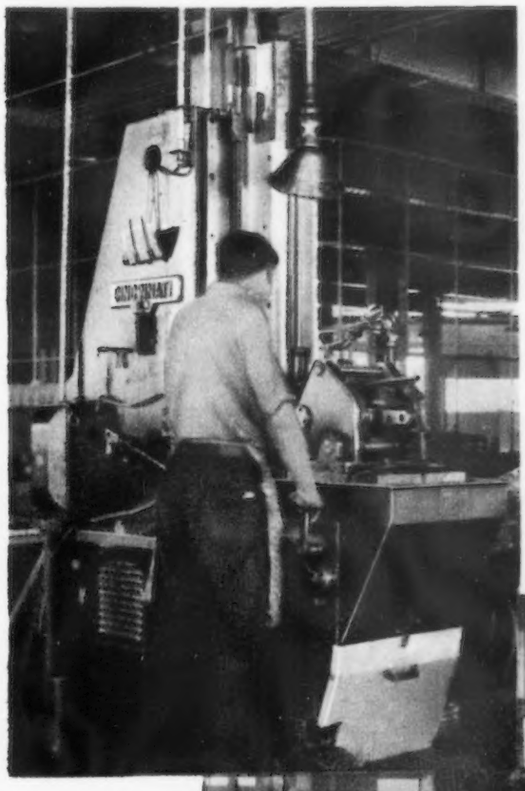
In the case of several types of blades, the blade and its base are separate elements, joined by dip brazing. Blades of this construction, up to ¾ in. section, have the root grooved and the sides finished on a battery of high-production external broaching machines. Width of the groove is held to 0.002 in., while the depth is broached to a tolerance of 0.0015 in. Variation in vertical location of the two surfaces must not exceed 0.001 in., and taper is held to the same tolerance.

Forged blades are processed progressively in a number of operations. The sides of the base and the side of the blade section are first machined on a duplex miller. Surface grinding of the side of the base is followed by a concave milling operation. The base must be held in absolute relation to the concave side of the blade; this relation is carefully checked on benches adjacent to the machine by means of a special box gage.

Subsequent operations include milling the taper on the back of the blade, and radius milling of the T-root, the latter on special high-production opposed-spindle milling machines of recent design. Dial gage fixtures have been developed for checking the radius and angles produced.

Another example of modern equipment is a battery climb milling machines for blades that are machined from the solid. Important fits are completed at each cycle of the machine, and high production is obtained. Gang cutters of formed type—seven or eight on one arbor are employed.

Ingenious box-type gages are employed to check the various crit-



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BELOW

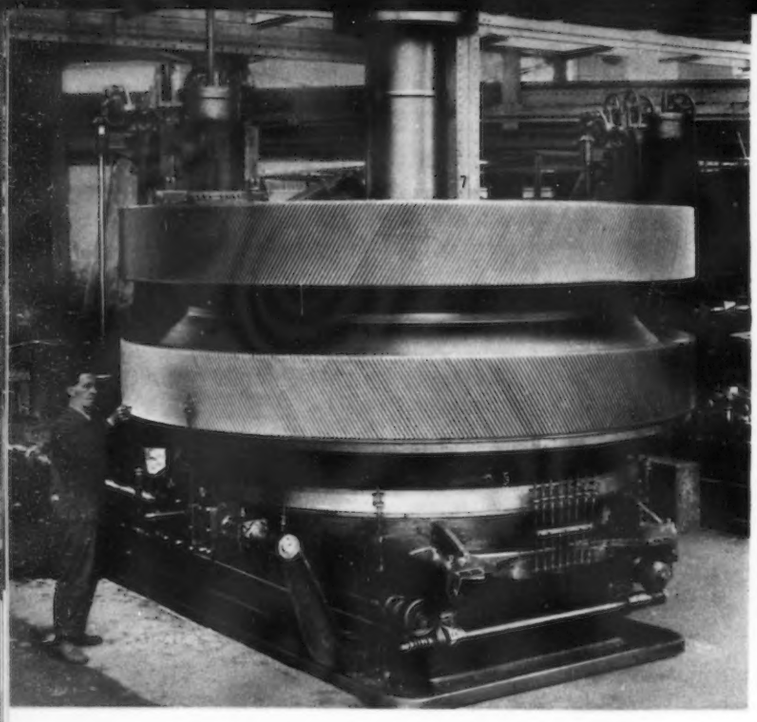
Partly bladed HP rotor for 165,000 kw. turbine. The complete turbine weighs more than 700 tons and develops enough power to furnish all electrical service for a city of more than 500,000 population.



ABOVE

In external broaching of blade roots, high production as well as close accuracy and high finish is obtained.

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High - speed reduction gear sets for transmitting up to 35,000 hp. are made at this plant. This shows a 32,800 SHP gear on a hobbing machine.

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ical relationships of the blade to base, etc. Some of the larger blades have a Stellite shield strip attached to the inlet edge of blade on the convex side by silver soldering—done to protect the blade edge against erosion.

At the end of the production of both the reaction and the impulse blading lines is located the inspection department. Checking of the relation of the blade surface to the base is the crucial inspection, done to form gages. An interesting new practice is the inspection of surface flaws by means of a magnetic testing device.

Impulse Blading Made from Bar Stock

Impulse blading is machined from square or "rhubarb" section bar stock cut to length. First operations are straddle milling on duplex machines and grinding of the sides on a vertical surface grinder. Concaving on standard millers and grooving of the base on double arbor milling machines follows.

The blades then go to a battery of special high-production automatic millers for a series of operations. From one to five blades are machined at one time in one row of the drum fixture; and there are seven rows on a drum. The blades are next convexed on milling machines using form cutters. This convexing, as well as the concaving previously mentioned, has to be done so accurately that no fitting is necessary when the blades are assembled in the turbine rotor.

Metallurgical Control Basic

It has been said that no machine has had more study metallurgically than the steam turbine. In fact, to better materials as well as to better design is attributed much of its present high efficiency. Careful control of all materials is necessarily a major activity of a turbine building plant.

Turbine casings or cylinders are made of carbon steel having a tensile strength of 70,000 lb. per sq. in. although carbon molybdenum steel castings are being increasingly used where casings, steam chests and other steam carrying members are subjected to temperatures, say 850 deg. F. or above.

As to rotors, there are four different material standards. The first two are carbon steels containing 0.40 per cent C. Where high strength, because of high centrifugal stress from speed effect, etc., is required, a 0.40 per cent C., 3 per cent nickel steel is employed for the rotor. Then, a nickel-chromium-molybdenum steel is used where still higher strength is required.

All rotor forgings are required to have 2 to 8 in. hole bored axially and finish reamed by the supplier of the forging. The hole is subsequently explored to make sure that the forging is sound internally. Sizing (or concentricity) of this hole is checked by a special dial gage, and inspection of the condition of the material adjacent to the bored hole is made by a special optical instrument, designated as the "borescope," employing a system of mirrors. Physical tests are made from test rings.

Number of Parts Nitrided

Casing castings are received in the annealed or normalized condition. After machining they are annealed in furnaces, used also for stress relieving of welded structures.

Rotor forgings are never quenched as this would set up high stresses; the heat treatment is restricted to air cooling. Some of the rotors, particularly the larger ones, receive as many as seven heats to assure stable conditions natural to the particular steel employed.

Other heat treating operations include nitriding of valve stem guide bushings to obtain a material that will carry fairly high loads, without means of lubrication, at high temperatures and with entire freedom from galling or seizure. Other nitriding applications, where resistance to wear, etc., are required, include: Diesel engine crankshafts, 9 to 10 ft. long, wristpins, etc. An important use of nitriding is in the valves employed on bleeder type turbines, the nitrided valve being said to withstand the high temperatures without drawing or seizing.

Welding and Cutting

Supervision of welding and flame cutting is under the metallurgical department. Most of the welding is on reduction gear casings and gear blanks, condensers, heat exchangers and bed plates for oil engines, turbines, etc. Some of these combine rolled and cast steel members. Certification of welders by X-raying of welded coupons is standard practice. Floating inspectors at intervals also check the work of individual operators. Interesting facilities for X-ray inspection of both welded and cast structures are to be seen at this plant. Gamma ray inspection is also employed, a permanent supply of radium sulphate being on hand.

NEWARK WORKS

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"SCIENCE is Measurement." The development of any science beyond the imaginative stage has always necessitated measurement. With the introduction of the alternating current in the United States by George Westinghouse there arose the urgent necessity of measuring apparatus for this new form of current.

The difficulties in understanding the alternating current in those early days was largely due to the absence of measuring means, and the sale of this new current necessitated a commercial form of meter. It was quite natural, therefore, that the Westinghouse Company, which introduced the a. c. system in America, developing it from its crude European ideas to a practical engineering form, should pioneer the development of the necessary motors.

Thus the large Newark Plant where electrical measuring instruments of all kinds are manufactured is the logical outgrowth of this pioneering work. Today, equipment is available at Newark to make whatever exacting electrical measurements may be required.

Fifty years ago electrical measuring apparatus was of the laboratory type, and practically confined to direct currents. No alternating current commercial forms of meter were available. To the mind unprepared by alternating current theory, the first Westinghouse meter, invented by Shallenberger and placed on the market in 1888, presented a development as mysterious to many, as it was unique and successful. A simple disk element rotated without the application of any visible force and without electrical connection to the current at a rate proportional to the current used.

The first alternating current switchboard-indicating instruments also appeared in 1888, which year also saw the first direct current instruments of other makes.

As the development of the art of measurement proceeded, it began to be realized that the manufacturing problems were quite different from those for either heavy industry on the one hand, or light machinery on the other. For requirements of precision, scientific approach, and mass production of very small parts, it could be compared to the art of the watch maker. Such work required a specialized form of skilled labor both for the intricate tool development and for the production operations, and the Westinghouse Plant at Newark was ideally situated to draw upon a supply of the available talent.

During its history, the Newark Plant has turned out lamp sockets, motors, radios, automobile equipment and arc lamps. However, within the past decade the plant's interest has been centered in meters, instruments and relays to the exclusion of practically everything else.

The present Newark Works spreads over two entire city blocks. it varies from four to five stories in height and has about 330,000 sq. ft. of useful floor space. Spread over this area is a series of manufacturing operations which for variety, accuracy and ingenuity would be most difficult to duplicate in any other industry in the entire country.

The Newark plant is equipped to manufacture 127,640 different distinctive types of units. There are many varieties of integrating and demand meters, there are indicating and recording instruments and oscillographs, there are protective and auxiliary relays, many electronic measurement and control devices and a multitude of timing units such as time switches, clock motors, etc.

Obviously, no detail can be given regarding these many units, but it is interesting to examine the wide range covered. For instance, one standard product is a small meter having a full-scale deflection of 6 micro-amperes. The pivots for the movement of this standard instrument have a radius of 0.0005 in.—and this is a true radius, not merely a point. Even more delicate specialty instruments come from this plant, for instance, those used by the medical fraternity for measuring currents set up by the human heart. On the other hand, the plant turns out huge assemblies which control and indicate what is happening in an entire power plant.

There is also a wide range in numbers of instruments produced. Perhaps only several high-precision oscillographs are made and tested in one week. On the other hand, watt-hour meters are made on an assembly line capable of producing, testing and adjusting over 3500 units each working day.

There is a complete story in the making of these watt-hour meters alone. They must have the precision of a high-grade watch at one-third the price. They must be sturdy, they must withstand the ravages of desert storms, arctic winters and tropical humidity year in and year out with no attention, and at the end of twenty years still be measuring current with an accuracy of ½ to 1 per cent. To meet these specifications is no mean production task.

Each gear used has individually milled teeth, and every one is individually projected on a screen at 100 diameters magnification to disclose any inaccuracies. Small jewels are carefully ground, lead impressions are made of the pivot seat and these impressions are carefully matched with pivots to assure correct pivot-jewel assemblies. Gears and pinions, some of which weight 500 to an ounce, are individually machined, tested and assembled. All together there are 190 parts and over 680 specific operations in fabricating raw material into a satisfactory integrating watt-hour meter.

These meters are the pride of the Newark Works. But equal accuracy is built into the thousands of other instruments. Newark gives full credit to other achievements in the electrical industry, but believes these advances have depended to a considerable extent on its ability to furnish accurate, sturdy and inexpensive instruments, which are essential to electrical progress.



East and Chicopee

Extensive use is made of overhead conveyors, as illustrated in this view of the refrigerator unit department.

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AN offshoot a little more than 20 years ago of the Chicopee Falls, Mass., plant, which was the first Westinghouse factory in New England, the East Springfield, Mass., works now comprises 20 buildings on a site of 50 acres.

Straight line, continuous production, with striking use of overhead traveling conveyors, extensive provisions for inspection and other forms of quality control, and finally, manufacture of many parts to tolerances of 0.0002 to 0.0004 in. characterize operations at this plant. Manufacturing floor space is approximately 717,000 sq. ft., and the number of employees at present average about 4300.

Although acquired in 1915, the East Springfield works was not used for manufacturing any of its present products until 1919, when the making of small motors was begun. Other products followed, the two latest being refrigerator units, and air conditioning units, the latter in capacities from two to 22 tons. Water cooling units and special design Coca-Cola dispensing units are also made. Fans of wall, ceiling, desk and pedestal type; vacuum cleaners of both floor and hand types; and food mixers are also produced. The motors range from 1/200 to ¾ hp.

The refrigerator units are shipped to the company's Mansfield, Ohio, works for assembly into steel cabinets.

Production of these products is for the most part in separate buildings arranged for progressive manufacture, except for a number of accessory finished parts and castings, screw machine products, stampings and the like furnished by feeder departments. One outstanding feeder department is the punch press division, which occupies floor space of about 50,000 sq. ft. and is equipped with more than 100 power presses.

The refrigerator unit manufacturing layout, contained for the most part within a 100 x 600-ft. building, is the largest single unit of the works. In it is produced one of the most accurately fitted mechanisms of any Westinghouse product.

The most precise machine shop job is the pump unit of the refrigerator compressor assembly. Components of this pump are: crankshaft, connecting rod, wrist-pin, piston and cylinder. Machining operations and tolerances are as follows:

The crankshaft, a forging about 7½ in. long, is first centered at one end. Turning of the long bearing, the crank end and of the bell crank follows, in the order named. Next, the piece is inspected, and is then nitrided. Centerless grinding of the long end and fixture grinding of the crank end complete the machining of this shaft, which is held to limits of 0.7487 to 0.7490 in. Practically a mirror finish is also required. The crank bearing, on which the connecting rod is mounted, is ground to limits of 0.7499 to 0.7504 in., while the component bearing on



Refrigerator cylinder heads and valve plates are machine and hand lapped. A gas tight fit is required, as gaskets cannot be used.

Springfield Falls, Mass.



A sea of rayon spinning motors ready to be shipped from the department in which they were manufactured.

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the connecting rod is honed to a tolerance of 0.0002 in.

The main bearing into which the crankshaft fits, also finished by honing, is held to limits of 0.7495 to 0.7502 in.

Wristpin and wristpin bearings are selective assemblies, with a maximum allowance of 0.0003 in. between pin and bearing. The wristpin is nitrided; machining operations include centerless grinding.

The piston, which is about 1 in. in diameter and 13/16 in. long, is held to a tolerance of 0.0002 in. It is turned from bar stock and finished by centerless grinding.

Limits of 1.0009 to 1.0011 in. are specified for the pump cylinder, which is made from a special cast iron. Even with these limits, selective assembly in eight steps, with 0.0002 in. as the maximum variation between component members, is required.

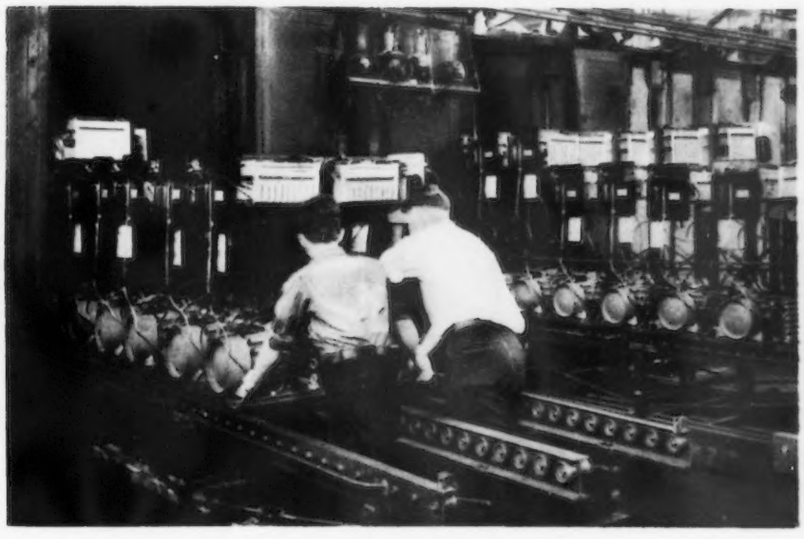
Machining of the cylinder includes rough boring, facing and drilling of the cylinder head, and drilling and tapping of the unloader port, the drilling being done by a special two or three-way drill. Next follows the honing of the cylinder hole, and the machine lapping of the valve boss.

Cylinder head and valve assembly complete the pump unit. The surfaces of these parts are first ground on a machine equipped with a magnetic chuck and then lapped to a gas-tight fit, as gaskets cannot be used. Testing of high spots on these lapped valve plates is by means of an instrument using reflected light. When the work is flat, straight parallel lines appear under the viewing glass. When the work is not flat, the lines are wavy.

Before final assembly each part is rigidly inspected. Crankshafts are checked at a number of places along their length and in two radial directions at right angles to each other. Piston diameter is checked on optical gages that will detect extremely small variations. After inspection each piston is numbered by means of an electric etching pencil according to its diameter, in variations of 0.0001 in., and is then fitted to a cylinder that bears a similar number. With this selective assembly the oil film clearance between piston and cylinder is held to 0.0002 in. Cylinder diameters are checked on an electric gage that indicates variations of less than 0.0001 in.

Inspection is followed by assembling of rotor, crankshaft and other parts to the motor frame, then washing the entire compressor unit in a special machine. Each compressor is also given a pump test, in which it is required to handle a definite amount of air at a predetermined current consumption in a given number of seconds.

These inspection and assembly operations are carried out in a large, glass inclosed, air conditioned, dust-proof room. A similar dust-proof room is employed in assembling the sealed air conditioning units. When the various



Charging refrigerator units into dehydrating ovens. Roller-conveyor-transfers connect with ovens and the roller conveyorized assembly lines.

components have been pressed into place, the shell is sealed by arc welding the head end. This is followed by a leakage test of the welded joint, under water.

An 8-hr. dehydration process, in a number of roller-conveyor equipped ovens, follows.

A 16-hr. performance test is the culmination of a number of tests and inspections. Almost every group of operations ends up in an inspection bench adjacent to the group. Then, in addition to the performance testing of each unit before being stocked for shipment, 15 or more units are selected at random each week from stock and examined for defective finish, etc. They then go into a "hot room", where, assembled in a refrigerator cabinet, they are required to operate at temperatures even higher than those encountered in household service.

In all divisions of the plant equipment and processes are for the most part of current development. Cemented-carbide tools are employed extensively, and extensive use is made of torch brazing and of all types of welding. Tinning layouts of large size and high efficiency and ingenious equipment for the automatic soldering of motor rotors are among several noteworthy developments.

All Divisions Highly Conveyorized

The mass or continuous production characteristic of this plant is apparent from the first step into any of the various manufacturing units, where slowly moving overhead traveling conveyors immediately catch the eye. These are ingeniously arranged and are of all forms, including "ferris wheel", "roller coaster", the latter at points where one or more ascends to let another pass, and finally roller conveyors between machines constituting a group of operations on a single part or on an assembly. Parts come to operators and inspectors at each station at a height that reduces the necessity for reaching very far either in taking the parts to be worked on or placing finished processed parts for conveying to the next process. Nowhere does an operator have to walk more than two steps for his material.



Optical measuring instrument which automatically assigns pistons to one of eight groups of selective assembly.

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In addition to keeping operating groups supplied with raw material, semi - finished or finished parts, these overhead conveyors serve as "traveling storerooms", thus eliminating to a large extent the necessity for raw materials and parts stores, with their floor space and personnel requirements. Then, in keeping materials and stock off the floor, they make available an immense amount of floor space for machines and other production equipment and their operators.

Radio Equipment Made at Chicopee Falls

In concluding, it is fitting to mention again the "older brother" of the Springfield works; namely, the Westinghouse Chicopee Falls, plant. Although one of the smaller units from a manufacturing floor space standpoint, and much of it not accessible to visitors because of the character of work at present in process, this particular plant is not without considerable interest. Its main product is transmitting and related radio equipment, although some of its facilities are devoted to the straight-line production of Coco-Cola dispensing equipment, using the special cooling units made at East Springfield. On the radio end, it should be mentioned that this plant, in some respects a large laboratory, contains an interesting master instrument for making frequency measurements, a service regularly performed for radio broadcasting stations.

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Belt conveyors move the work from one operator to another in the fractional-horsepower motor line.



MANSFIELD WORKS...

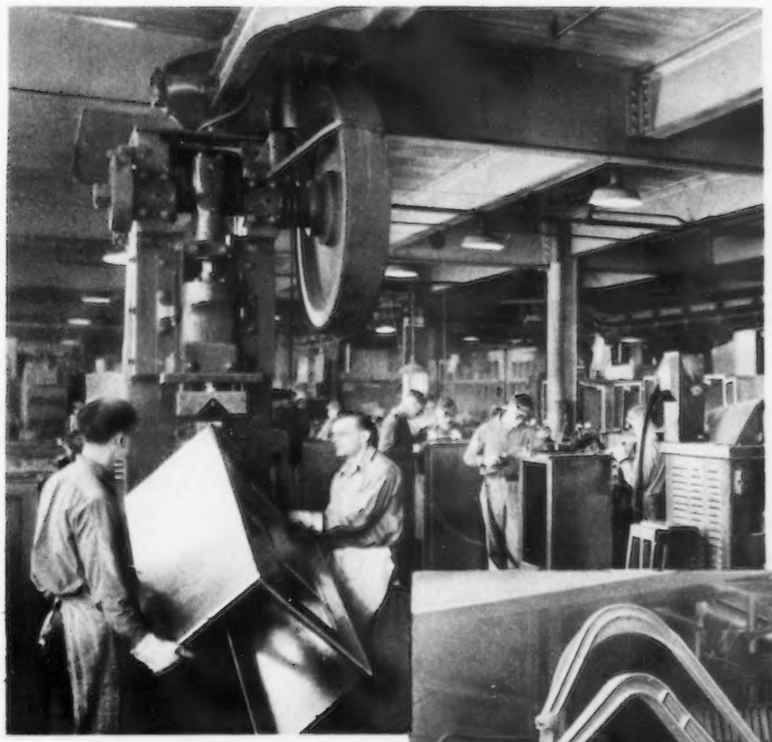
A SMALL abandoned plant acquired by the Westinghouse Electric & Mfg. Co. in Mansfield, Ohio, in the spring of 1918 has steadily expanded both during good and bad times until today it is one of the country's largest producers of electrical household equipment. Here is located what the company designates as its merchandising division, for not only are the electrical products made there, but the merchandising of these household appliances is also entirely handled in Mansfield by a large and efficient merchandising organization. Sales of air conditioning equipment and water coolers and some other appliances that are not manufactured in Mansfield are also merchandised by this division.

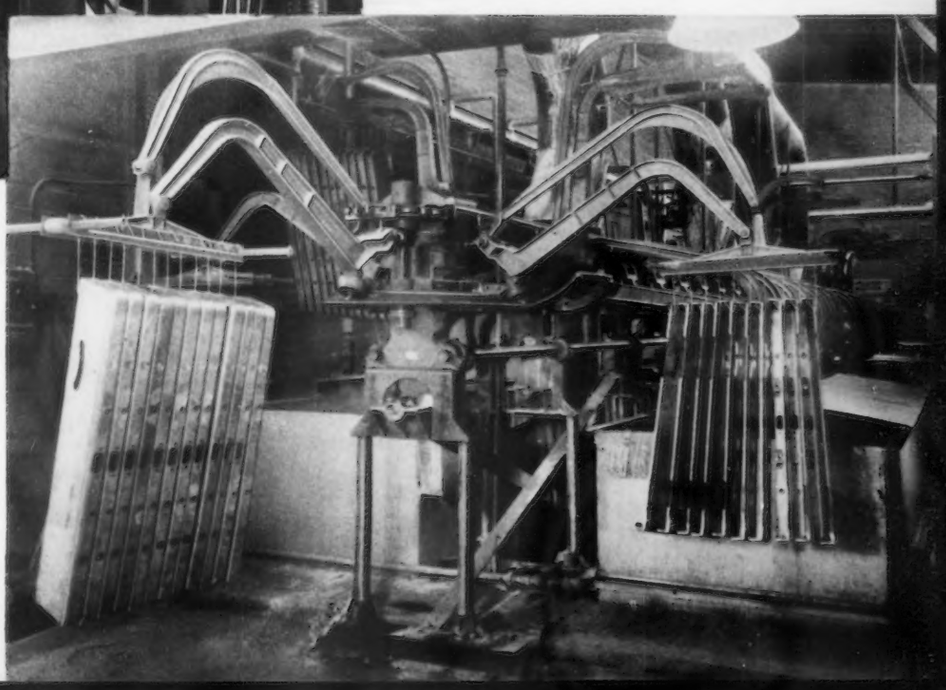
Starting with 100 employees and with 100,000 sq. ft. of floor space, the principal products of the plant for some time were electric ranges, toasters and flat irons; very few products as compared with the numerous appliances for providing comforts for the home, which are now manufactured in the Mansfield plant.

Today the Mansfield plant provides over 600,000 sq. ft. of floor space in its seven buildings and this does not include considerable outside warehouse space and it gives employment to over 4000 persons. The plant continues to grow in size, for this space will be increased 300,000 sq. ft. by the erection this year of another building for warehouse, office and other purposes. A meeting and display room to accommodate 500 people will be one of the features of the building, being provided for gatherings of members of the field organization and dealers.

To the rather limited line of products originally made at the plant new small electrical household appliances were added from time to time. Ingenuity of the engineering department has been devoted to the developing of new products, redesigning and improving old lines, the steel industry has aided by producing new and improved metals and the production department has done its part in improving processes and methods, so that production costs have been reduced and this saving has been passed along to the ultimate purchasers. These reduced prices in turn stimulated sales, which was reflected back to the plant in increased production schedules.

The products of the Mansfield plant now include: Ranges and range accessories, toasters, waffle irons, hot plates, household refrigerators, automatic electric irons, standard electric irons, thermostats, water heaters, space heaters, cartridge heaters, steel clad heat-



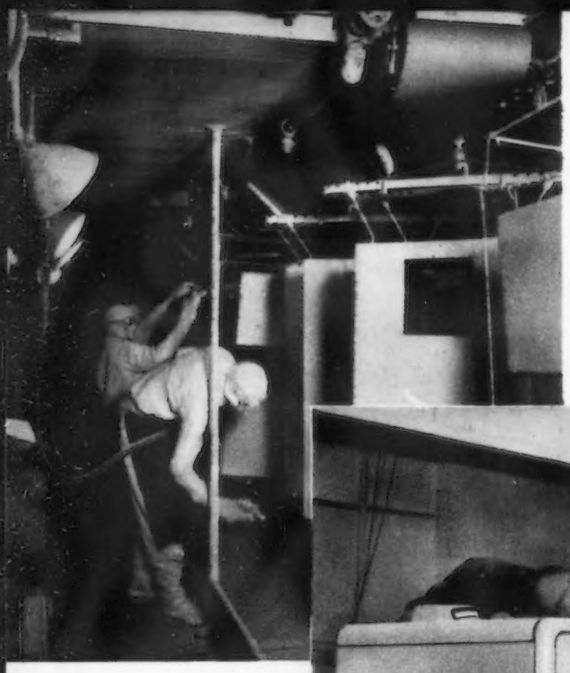


Refrigerator cabinets and parts are joined by welding in progressive operations, some of the welding machines being shown at the right.

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AT RIGHT

Special automatic machine in the porcelain enameling department for cleaning and pickling refrigerator cabinets and other parts. The work suspended on the arms shown is immersed automatically into a series of cleaning tanks arranged in two rows. Electric range parts were being cleaned when this picture was taken.



AT LEFT

One of the spray booths in which refrigerator cabinets are sprayed with a Dulux finish while moving through the booth on a conveyor.

• • •

BELOW

Matching colors of white parts on the electric range assembly line.



ers, solder pots, oil heaters, glue pots, stereotype heaters, dental furnaces, ironer elements, vulcanizer elements, miscellaneous tubular heaters, sandwich grills, solar glows, die block heaters, dryers, electric roasters, Cozy-Glow room heaters, dishwashers, coffee makers, and cord sets.

Designing and manufacturing electric refrigerators has been the most important development in the Mansfield plant and the refrigerator output now comprises more than one-half of the total production in the plant. Manufacture of refrigerator cabinets was started by the company in Mansfield in 1929, the refrigerator unit being made at the East Springfield, Mass., works where it is still being produced, being shipped to Mansfield where the refrigerator is now being completely assembled.

The company in its Mansfield plant was one of the first manufacturers of all-steel refrigerator cabinets. It also developed the hermetically-sealed refrigerating unit. The refrigerator department now has a capacity for producing 1000 refrigerator cabinets per day.

The plant is subdivided into various departments for manufacturing and assembling the numerous products. Equipment is arranged for economical, straight line production and for a large output in a compact space. This is particularly true of the refrigerator department.

The large amount of conveying equipment used in production and assembly work is an outstanding feature of the plant. Overhead conveyers and other types of power conveyers are provided wherever they can be used to advantage.

The welding process is generally followed wherever practical in the fabrication of household electrical appliances and one might have to go a long way to find a piece of equipment having so many welds, considering the size of the fabricated unit, as are used in joining the frame of an electric range. The parts of the frame, consisting of numerous light sections, are joined by 153 arc and 103 spot welds. Welding of this frame recently was substituted for bolting the members together. The welding is done in holding fixtures.

Laid out for mass economical production the refrigerator line is the most conspicuous feature of the plant.

Starting with the forming work there is a straight line of presses for progressive operations. Where similar parts are formed in different sizes for operations other than drawing, adjustable dies are used.

The flat rectangular blank that is formed into the front and sides of the cabinet and providing a narrow flange at the back is first given a series of blanking, pressing, notching and forming operations and then the piece goes to a special forming machine designed by Westinghouse engineers. In this it is folded to its shell form by a series of operations that permit a high production speed. Leaving this machine, parts are assembled to the shell by welding with a series of seam and spot electric welding and gas welding operations on machines arranged for progressive work and then the cabinet moves to the adjoining finishing department for drilling, grinding and polishing.

The finished cabinets are then cleaned, rinsed and bonderized, being handled in and out of tanks automatically on carriers suspended from a monorail crane. Leaving the overhead cleaning room conveyer the cabinets and parts are hung on another overhead chain conveyer 1450 ft. in length, moving at a speed of about 5 ft. per minute, and they do not leave this conveyer until they reach the assembly line. While moving on this conveyer they pass through spray booths for the priming and finish coats, the latter a Dulux finish, through baking ovens after each coating is applied, are sanded under filtered air pressure in a glass enclosed room and are given other operations incidental to coating. The baking oven is 585 ft. long and the cabinets are baked at 283 deg. F.

The cabinet and parts are taken from this overhead conveyer at the head of the assembly line and after moving a few feet on a roller conveyer for assembling legs they are transferred to an assembly conveyer of the flat type, 190 ft. long. Various parts and insulating material are brought to the assembly line on feeder conveyers from which they are removed to the points where they are needed.

With a recent change, the refrigerating unit is now installed in the cabinet on the assembly line. This unit consisting of the motor, compressor, evaporator and control is delivered to the line on another conveyer that has been added for that purpose, on a special carrier in which they are brought from the East Springfield plant. This carrier eliminates the need of crating. The carrier with the unit is

lifted from its conveyer and set in position for pushing the unit into the back of the cabinet. The refrigerator line has been speeded up to the extent that it is possible to start a sheet in the presses at the front of the line in the morning and have it leave the assembly line as a finished refrigerator at the close of the day.

Porcelain enameling of refrigerators and other appliances is done in a newly equipped department which occupies a plant recently taken over by the Westinghouse Company and in which considerable new equipment has been provided.

The outstanding feature of this plant is that the complete refrigerator cabinet is porcelain enameled in one piece. The box is cleaned and pickled in a specially designed high lift automatic machine, being hung on a conveyer that loops around the end of the machine and immerses the boxes into two rows of tanks containing the cleaning liquid. Then the usual processes of spraying, drying and burning are followed. The chamber of the burning furnace is 78 in. high to provide sufficient room for handling the boxes.

The plant is on a production basis in vitreous enameling refrigerator cabinets in one piece.

One of the interesting parts of this plant is a porcelain enamel color matching booth. This is a room with white walls and ceiling that is lighted by a row of 39 alternate blue and yellow high powered lamps located along the side walls about 3 ft. above the floor. These provide 150 ft. candle intensity as compared with a 30 ft. candle intensity which is considered good lighting. Daylight is duplicated and shadows are eliminated. Parts are matched and sorted into three classifications, depending upon their degree of whiteness, so that parts having similar whiteness will be assembled in one unit.

In the main plant thickness of vitreous enamel or lacquer is checked with a magnetic gage to determine whether the coating material is being applied to the proper thickness. Ability of painted, lacquered and chrome plated parts to withstand humidity is checked in a humidity cabinet. These tests are found particularly desirable in testing the coating of refrigerator cabinets made for the southern countries.

Interesting manufacturing processes have been developed for making heater plates that are set in the top of electric ranges. These are made of stainless steel of the common 18-8 analysis, which is used because of its heat and corrosion resistance qualities. When the range department is in full operation 1500 of these heating units are made per day and these require 3000 lb. of stainless steel sheets. The heating unit is built up of two of these plates between which the heating elements and insulation are placed.

The stainless steel reaches the plant in the form of disk shaped blanks with terminal buttons drawn in the piece. The first operation on this blank is drawing a spiral on the piece and this for stainless steel requires two operations, the first draw being for one-half the depth and the second for finishing the draw. Between the two draws and after the second drawing operation the plates are annealed in a continuous gas fired furnace in a bright annealing atmosphere, the reducing atmosphere being produced by cracked natural gas. The annealing temperature is 1860 deg. F.

The furnace has three zones, 8 ft. for bringing the pieces to heat, 8 ft. for heating and 16 ft. for cooling. The disks remain in the furnace about 5 minutes. They are loaded on an expanded stainless steel conveyer composed of sections several feet long, which are carried through the furnace by the conveying mechanism. There is also another press operation for piercing holes in the terminals and center.

The plates are pickled and cleaned after annealing and then given a bright dip in a solution of 8 per cent nitric and 2 per cent hydrofluoric acid to remove any oxide that may be left on the surface. The two plates are assembled after the heating element is placed between them by crimping the edge of the top piece over the bottom piece and joining the two pieces by spot welding.

The electric ranges are assembled on a slat type conveyer located at a convenient distance above the floor.

One of the most recent products in the plant is a portable roaster which can be plugged in at any light socket and is designed for use in small apartments or at camps. This is rectangular in form with a black enamel case trimmed with a chrome plated strip. It has control for temperature ranges from 150 deg. to 550 deg. and may be used for any cooking operation that can be done in a stove. Three kinds of food may be cooked at one time in three heat resisting glass dishes and by removing the dishes there is sufficient space for baking a good sized roast.



Portable electric roasters also have their assembly line.

Cleveland



View in the assembly department showing the assembling of luminaires for mercury-Mazda combination units, which is done progressively on a roller conveyor.

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THE manufacture of Westinghouse lighting equipment is centralized in Cleveland, where the lighting division manufactures electric lighting units for practically all purposes including standards and luminaries for ornamental street lighting.

In addition to its processing and assembling facilities, the plant includes a modern continuous foundry which makes the castings used for lighting equipment. The foundry acts as a feeder section for six other Westinghouse plants. Most of the foundry work is in iron, although many aluminum and copper alloy castings are produced for lighting fixtures.

Commercial and industrial lighting now present so many variations in requirements and in design that mass production methods cannot be followed in manufacture. Thus the plant has been aptly described as a large job order production shop making lighting products. It is said to be the largest one that manufactures a complete line of commercial, industrial, flood, aviation and street lighting equipment. One of the latest developments in the lighting field is the nigh Intensity Mercury lamp, for which reflectors and ballast equipment are being produced in the plant.

Materials used in the manufacture of reflectors and auxiliary lighting equipment include copper, brass, bronze, aluminum and steel, largely in sheet form, and some cast iron, cast aluminum and zinc die castings. Considerable steel is used in the manufacture of small parts and transformer cores, covers and cases.

Manufacturing processes used in the manufacture of lighting equipment include spinning, polishing and metal finishing. Various kinds of finishes are applied in a well-equipped plating department. Facilities are also provided for finishing aluminum reflectors by the rather recently developed Alzak process. Both hot and electrolytic galvanizing is done to provide a protective coating, mostly for street arm brackets and pole top fittings.

For plating, cadmium, nickel, copper, brass, and even some gold is used.

Reflectors for lighting equipment are made of aluminum, chrome plated brass, silvered glass and porcelain enameled steel.

There is a strong trend at present toward the use of Alzak finished aluminum reflectors, these replacing vitreous enamel steel and chrome plated units.

Aluminum finished by the Alzak process is becoming more popular for reflectors, because of its high reflectivity and the permanence of the finish, which is said to be non-tarnishing. The aluminum reflector finished by this process is given an electrolytic treatment which brightens the surface. This is followed by another anodic treatment or alumiliting process, which causes the formation of a thin protective coating of pure oxide on the surface. With a slight modification in treatment two types of finishes are provided by this process, one a specular or bright mirror-like finish and the other a diffuse blotter-like finish.

The Alzak department consists of special tanks with accurate control system together with a motor generator set to supply the proper current densities, a drying oven and other equipment.

All types except the glass and porcelain enamel reflectors are made in the Cleveland plant. Some reflector designs lend themselves to draw press operations. Others are formed in successive spinning operations, depending on the shape and material used. These are made from sheet material in various gages depending upon the application involved, the majority being from 0.038 to 0.063 inches. The

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Pouring molds for iron street lighting standards. The flasks are st



Works.



Spinning lamp reflectors. The operator of the machine at the right is starting to form the reflector from a circular blank cut from an aluminum sheet.

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spun reflectors are made in sizes up to 25 in. diameter and 18 to 19 in. deep.

Successive spinning operations are required for the complex shapes and deep designs to insure uniform gage of material free from spinning rings in the finished product. To assist in obtaining the required quality chrome plated steel forms are used.

Polishing of reflectors and parts is done in four or five steps on emery wheels built up with 60 to 200 grit, after which the pieces are color buffed with various compounds.

The plating department is fully equipped for efficient production of work with the various plating processes. Steam heated drying ovens with treadle operated doors are provided for drying small parts after cleaning and plating.

Parts for commercial and residential lighting fixtures that are given the antique brass finish are first cleaned, brushed with a wire brush, pumice and water. Then they are oxidized in caustic and colored by brushing with a brass wire brush. They are then given a coating of clear lacquer.

Nickel plating is used extensively as a protective coating for lamp socket details and similar applications. Screws, nuts and some other small parts are cadmium plated as a protection against corrosion.

As each mercury lamp requires ballast equipment to limit the flow of current, the plant makes a large number of transformers. The cases are made on a draw press from 0.063 in. gage sheet steel. The cases are 6½ in. in diameter and are up to 10 in. deep. Transformer coils are wound, impregnated, and assembled in one section of the plant.

Film cut-outs for series street lighting, which are manufactured by the million, are made of two aluminum disks ¾ in. in diameter, between which is placed an asbestos washer and a compound which fuses at time of lamp outage, thus reestablishing the circuit. The disks and washers are blanked on a punch press.

Housings for airway beacons and searchlights are made of cast aluminum. Most airway beacon housings are 24 in. in diameter, but those for large searchlights have been made with diameters up to 60 in. Floodlight bodies in the larger sizes are made of cast aluminum and the smaller bodies either of cast or spun aluminum or porcelain enameled steel.

The assembling department is arranged for progressive operations and to reduce handling. This is accomplished by performing the assembly operations on roller conveyor which facilitates the movement of work from one operator to the next. At the end of the assembly line the work is packed and carried on skids to the shipping department. Sockets are assembled on a bench in the center of which is a roller conveyor for moving the pieces along for successive operations.

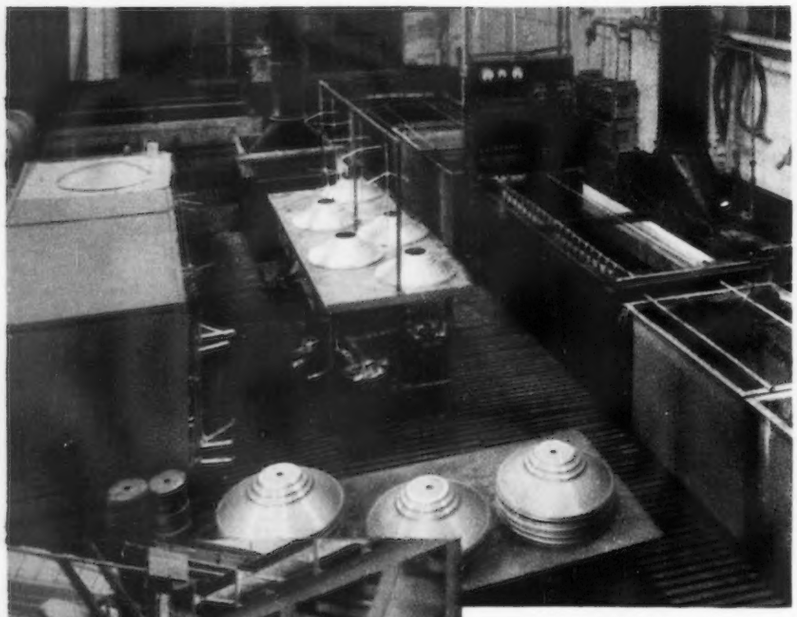
Equipped for large production of gray iron castings and the sand casting of aluminum and copper alloys, the Westinghouse foundry in Cleveland is a modern continuous plant with a capacity of 1,500,000 lb. of castings per month, including 15,000 lb. of aluminum castings.

Included in the equipment are three power conveyors for handling flasks, molds, pouring, and shaking out. Two cupolas supply the metal which overhead conveyors deliver to the pouring platform. Another feature of the foundry is the use of a large molding machine for making molds for both iron and aluminum castings. This is a jolt, squeeze and draw machine that is served by a gravity roller conveyor and is supplied with sand by overhead sand conveying equipment that is connected to the main sand handling and conditioning system.

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at a 10 deg. angle to permit an easy flow of the metal.





ABOVE

One section of the unit for producing a bright mirror-like surface on aluminum reflectors by means of the Alzak process. The drying oven is at the left.

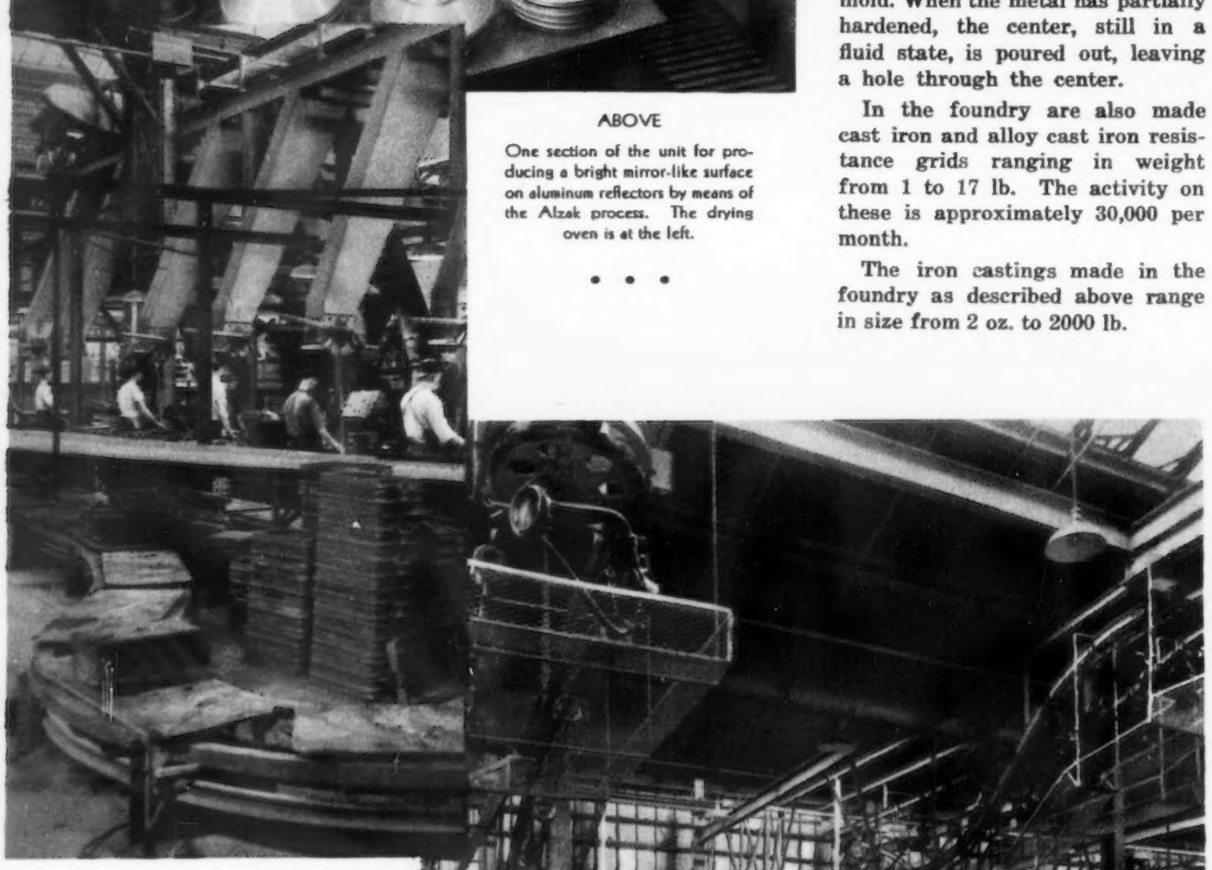
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The foundry products include iron street lighting posts 10 to 18 ft. in length and weighing 300 to 1900 lb. In making molds for these castings white metal patterns and iron flasks and a base and column core are used. In making the mold, the flask is set at an angle of about 10 deg. so that the metal will flow more easily. The thickness of the section in the post ranges from 5/16 to ⅜ in.

Several zinc alloy castings are made in permanent molds. One of the zinc alloy castings is a small straight tubular member about ½ in. in diameter by 10 in. long that is used in a residential lighting fixture and is made in a slush mold. When the metal has partially hardened, the center, still in a fluid state, is poured out, leaving a hole through the center.

In the foundry are also made cast iron and alloy cast iron resistance grids ranging in weight from 1 to 17 lb. The activity on these is approximately 30,000 per month.

The iron castings made in the foundry as described above range in size from 2 oz. to 2000 lb.



ABOVE

View in one section of the foundry showing conveyors, molding machines and sand chutes.

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AT RIGHT

The painting department showing the slow moving conveyor on which parts are air dried. Aluminum residential street lighting fixtures were suspended on the conveyor when this picture was taken. Spray booths are in the rear.



Assembling intermediate gearing in a gearmotor.

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Nuttall Works

ESTABLISHED in 1887 as the R. D. Nuttall Co., and acquired by Westinghouse 10 years later for the manufacture of street and other electric railway gears, this plant is one of the oldest of the Westinghouse manufacturing units. In 1914, it was moved from Garrison Alley to its present larger quarters in the Lawrenceville section of Pittsburgh.

Open industrial gears are made, but speed reducers and gearmotors, which combine motor and speed reducer in one unit, are at present the major products. A line of flexible couplings is also manufactured. Then, one section of the plant is devoted to the building of current collecting equipment including pantagraphs, trolley poles, pole bases, trolley shoes and wheels for street railways, electric railways, trolley coaches and industrial locomotives.

Gearmotors are manufactured in a number of standard sizes from fractional to 75 hp., and also in special sizes up to 125 hp. and higher, for both parallel shaft and right angle drives, single, double and even triple reduction. The motors used with them are supplied by the East Pittsburgh works.

Speed reduction units are likewise made in a range of standard sizes from 1 to 500 hp., while larger units are built special. This standard line and the gearmotor line feature single helical gears having a low helix angle and wide face, and are equipped with anti-friction bearings throughout.

Manufacturing floor space totals approximately 225,000 sq. ft., and the number of employees averages about 450. The plant comprises a large main shop, at one end of which there is a four-story building that houses the tool room and the screw machine, turret lathe and other feeder departments, a gear shaper unit for the production of the smaller gears, a pattern shop and a well-equipped chemical and metallurgical laboratory.

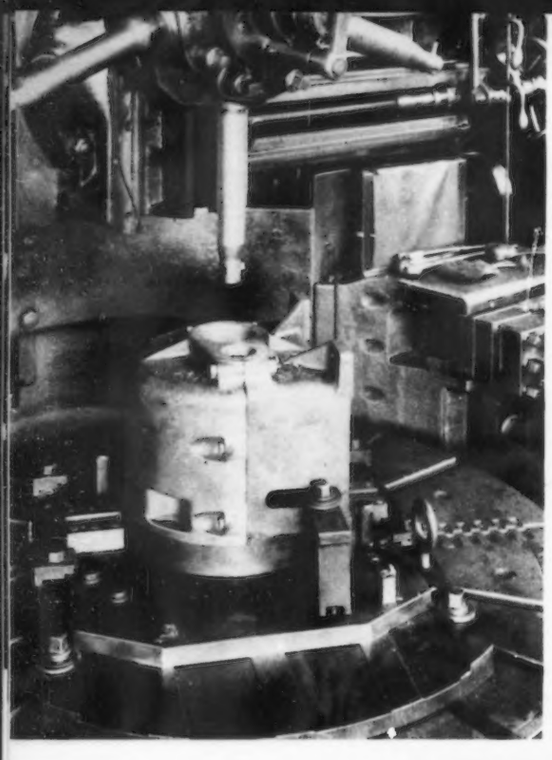
During 1934 the entire production layout was revised; equipment was grouped with respect to products manufactured rather than according to specific operations, so that now, production of the plant's major products is continuous within its own production center. This revision of layout was accompanied by an extensive study of machining methods, as well as of materials handling and other facilities.

Gears Hobbed With Shafts in Place

Interesting work-holding devices that have resulted in savings include a fixture that permits hobbing of gears with their shaft in place. Shaft and gear are assembled before the gear is turned. In the hobbing, one end of the shaft extends through a hole in the machine table. With this fixture, possible distortion is avoided, and in automatically assuring concentricity of gear and shaft, it eliminates checking and possible subsequent correction for run-out.

Another time-saving fixture, accompanied by a change in machine equipment, is in connection with with the boring of a gear housing that has two double bores, the center distance of which has to be held to plus 0.003 in., minus 0.000 in. Formerly the work was done on a single-spindle horizontal boring machine, preceded by slab facing of the two bores; it is now being done much faster on vertical turret lathes equipped with a special indexing fixture.

The fixture is made up of a stationary base-plate and a sliding top plate. The latter is located in position by means of dowel plates, and thus may be indexed without disturbing the clamped work. Work clamped to the sliding top plate is automatically centered for the boring of the first hole. The second hole in the casting is then centered merely by releasing two dowel pins and sliding the top plate to the second set of dowel holes in the bottom plate. The facing of these holes is done from similar indexing points. With this arrangement, matched cuts are eliminated and a true level surface is assured for the bosses of both holes—which is very essen-



the outside diameter and bore of large ring gear blanks. The wheel spindles are driven by individual motors at the top of each spindle.

What are believed to be the most accurate large railway ring gears ever made were finished on this grinding equipment. These were for the Pennsylvania class P-5-A passenger locomotives, three gears having been furnished for each of the 58 Westinghouse locomotives. They are about 53 in. in outside diameter, and have 91 teeth, 1¾-D.P., 5¾-in. face width. Grinding included the outside diameter, the bore, one side of the blank, and, finally, the teeth. Tolerances were: tooth thickness, plus 0.000 in., minus 0.005 in.; tooth spacing, plus or minus 0.0005 in.; outside diameter, plus or minus 0.005 in.; and bore, plus or minus 0.002 in. At a train speed of 90 miles an hour, the pitch line velocity of these gears is about 5700 ft. per min.

A number of gear tooth lapping machines of special design, with capacity ranging from small pinions to gears as large as 8 ft. in diameter are also to be seen. In addition to removing cutter marks, assuring fine finish, etc., the lapping of gears on correct centers before assembly in the gear case serves to eliminate difficulties on the test floor.

One of the lapping machines is in the form of an engine lathe with a special faceplate and carriage that permits the heat-treated gear and its pinion to be lapped on correct centers. The gears are also run in oil in the same setup for a short time for polishing. The arrangement is such that the center distances can be changed readily.

Carbide Tools Employed On Steel

Tantalum and titanium cemented-carbide cutting tools are regularly employed for machining steel as well as other materials. One application is in machining a 52-in. diameter, 14-in. face gear blank, which is rough turned at a speed of 141 ft. per min., a feed of 0.018 in. and a ⅝ in. depth of cut, and finish turned at 200 ft. per min., 0.035 in. feed.

Heat-treated shafts of S.A.E. 1045 steel, 300 Brinell, are being turned in a full ball-bearing lathe, equipped with ball-bearing live center, at a speed of 290 ft. per min., 0.022 in. feed. Gear fits on other steel shafts have been finish turned at a speed of 630 ft. per min., 0.008 in. feed.

ABOVE

Special centering fixture employed on turret lathe for boring the bearing end of gearmotor housings. The human element in setting up center distance is eliminated and output is increased.

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AT RIGHT

Speed reducers from 3200 to 5000 lb. in size are now assembled in a circle arrangement, with increase in production. The large jib crane at the center services all stands.

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tial because of the fact that the end plate for both bores is a single piece.

Gear tooth grinding and lapping is an interesting feature of this plant. One of the grinders has capacity for gears up to 72 in. in diameter, and is entirely automatic. The grinding follows heat treating and is intended to correct distortion and assure high accuracy and fine finish.

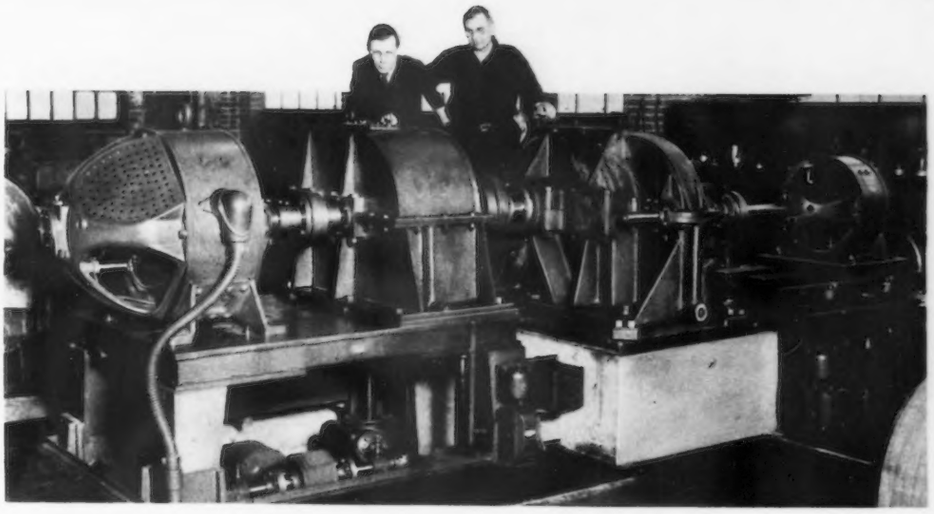
Another grinder, a specially adapted 72-in. boring mill, the rail heads of which are equipped with cup wheels, is used for finishing

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AT RIGHT

Speed reducers are given a full load test on this set-up. The platform that carries the motor and the one that carries the step-up drive and generator are adjustable.

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Assembly and testing operations are also noteworthy features of this plant.

Speed reducers ranging in size from 3200 to 5000 lb. are now assembled in a "circle" arrangement, with a doubling of production in the same floor space, and a reduction in number of assemblers and supervisors. Ten individual assembly stands are located in a circle with a large jib-crane in the center for servicing all stands. Work benches, small tool stands and racks of materials are positioned outside of the circle adjacent to each assembler. A cleaning tank, electric drills, an oil heating bath for shrinking on bearings, spacers, etc., and other units used by all operators are also at the center of the circle. The speed reducers are assembled on pressed steel platforms.

Oil Field Units Tested Under Service Conditions

Simulating field service, gear units designed for oil well pumping are tested on a rig consisting of a walking beam of the type and size actually used in oil pumping. One end of the rig carries a table loaded with cast iron weights; the other end of the beam is connected to the crank arm that is on the low-speed shaft of the gear unit. A motor is belted to a pulley on the high speed shaft. The object of this type of full load test is to reproduce torque reversal conditions (twice each revolution of the crank arm) to which such oil well pumping units are subjected in actual use.

Extensive Facilities for Heat Treating

For a gear production shop, the heat treating facilities at the Nuttall works are, perhaps, unusual. This department is centrally located, and its work is divided into two classes: namely, that heat treated and then shipped, and that heat treated and machined before shipment. Frequently gears as hard as 300 Brinell are required to be machined after hardening. Equipment comprises 15 or more heat-treating furnaces; four or more salt bath quenching tanks; equipped with jib cranes; a number of oil quenching tanks; brine tanks; and several special tanks containing a solution of the salts used in the company's "BP" process.

At inspection benches located in the same department, every heat-treated piece undergoes a hardness test, the results being recorded and filed according to the number stamped on the piece. Furthermore, in the case of large-lot production of one piece, five or more of the heat-treated pieces are selected at random and given a complete metallurgical inspection, including hardness.

Torch, or flame, hardening equipment in this plant is believed to be one of the first applications in the United States. It is used for hardening the teeth of very large gears that cannot be furnace treated and also for localized hardening of ratchets, pawls and the like.

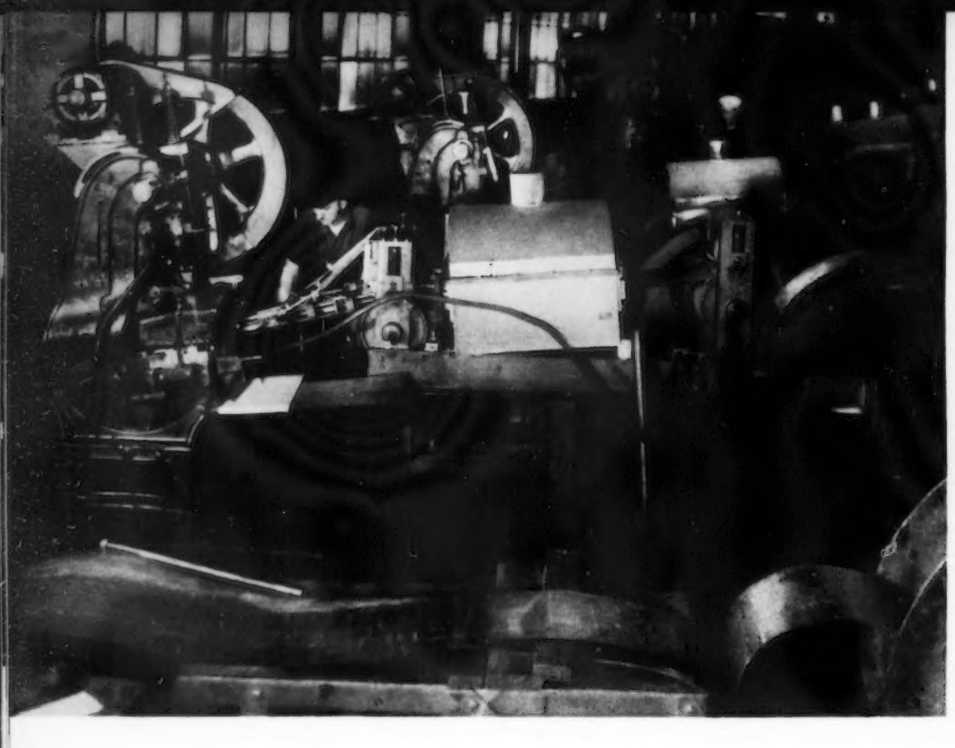
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AT RIGHT

Actual oil field service conditions are duplicated by this rig for testing of gear units designed for oil well pumping.

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Electric sheet, welded into a continuous strip, slit into narrow widths and wound on reels gives the same punch press operating economies as available with mild steel strip. Gas-fired or electric heating ovens are interposed between reel and press to soften the lubricant and give a mild anneal.

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SHARON W

IN THE Sharon, Pa., plant the manufacture of transformers is concentrated. Although the product is of a single classification, a wide diversity of manufacturing technique is called for owing to the extreme range in size, from 5-volt radio transformers up to large power units handling 287,000 volts in the primary and weighing as much as 300 tons. Shop operations at Sharon call for stamping "electric" steel laminations, insulating bare copper wire and winding it in coils, forming insulating pieces of fiber and Micarta, and fabricating tanks of welded steel, as well as manufacture of miscellaneous small parts.

Because transformers handle such high voltages and because they are subject to high surge currents and voltages generated by lightning, it is essential to have a high-voltage laboratory for testing this product. Sharon's laboratory can develop the highest voltages and currents of any of the Westinghouse high-voltage laboratories. The lightning-stroke current and voltage generator which was developed at this plant in 1933 is capable of producing a 3,000,000-volt charge which breaks down the gap so that currents as high as 150,000 amp. can follow within a few hundred microseconds. Largely as a result of the availability of this test apparatus, Westinghouse engineers have recently developed a distribution transformer that is practically surge-proof. The line can be struck by lightning without damage to the transformer winding itself. (Mass production of

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Power transformers are generally designed to meet the specifications of individual stations, but distribution transformers are of standard design made on what amounts to a mass production basis. Coils are assembled at stations, but a large number of individual connections can be made at long benches which are served by a pair of slat-type conveyors. At the end of this line the assemblies are placed on a roller type merry-go-round where they are picked off and tested for shorts and grounds, as well as general operating characteristics.





Coil winding equipment for the large transformers is segregated from that for the smaller units. Copper wire, rectangular in cross section, comes in reels and is wound with paper insulating tape in special machines. After the wire is wound on forms it is varnished and baked. Horizontal winder tables are shown; vertical face plates are also used. Coils for air-cooled transformers are set and dipped in Bakelite varnish, are baked, then wound with cloth and re-dipped and re-baked.

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N WORKS . .

these transformers is one of the major activities at Sharon now.)

In the early days, transformers were made at the main works in East Pittsburgh. In October, 1922, the present Sharon site was acquired from the Savage Arms Co. The equipment of an arms plant was obviously unsuited for transformer manufacturing and had to be disposed of. New machinery was installed and a skeleton crew started operations in June, 1923. Since those days, the plant has been largely expanded until it covers approximately twenty acres of floor space and normally employs about 2500 people, 10 per cent of whom are women.

The products of this plant range from small radio transformers, weighing 5 lb. or less, to large power transformers whose weight runs into hundreds of tons. While pole-type distribution transformers and power transformer units form a very large part of this output, transformers for use with metering instruments, voltage-regulating transformers, welding units and many other kinds of transformers are produced in large quantities. The larger sizes of power transformers are generally custom built for each customer, while the distribution types are made in standard sizes. An unusual type of transformer built in considerable numbers by this plant was a single-phase 4800-kva. unit for the Pennsylvania Railroad's new electric locomotives, where the primary voltage was reduced from 11,000 to 1400 volts.

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Testing and calibrating circuit breakers for use on distribution transformers. This breaker is immersed in the transformer oil and hence is tested under these conditions. It incorporates bi-metallic thermostatic contactors which respond to heat generated in the oil or by passage of heavy current through the elements. They can be set to trip in two stages, first putting on a red signal light to indicate danger and then disconnecting the transformer from the line at times of continuous heavy overload. Through the use of charts, a laboratory job has been put on a production basis, using girl operators.





RESEARCH

IT was a swashbuckling era, those several decades at the turn of the century. Old Vanderbilt accused young Westinghouse of trying to stop trains with wind. Carnegie, eminently successful in the rough and tumble steel game of that period, looked down his nose at a few self-effacing metallurgists and observed that "these damn chemists are ruining the steel business."

Industry was quantity conscious. It was more concerned with filling orders than pouring money into laboratories without assurance that this outlay would be immediately reflected in balance sheets.

Research *per se* had a somewhat ignominious status at that time. Even now its status is occasionally uncertain despite popular reverence for science and pseudo science. For, although correlated research is directly responsible for the preeminence of many industrial concerns, too often are appropriations slashed early in depression periods and hesitatingly revived as business cycles swing upward.

Highly theoretical research is often palmed off as a "luxury child," and too often has little defense against such an allegation. Industrial research, however, most decidedly wants to be recognized as a horse of a different color. Industrial research considers itself utilitarian, and it points with pardonable pride to innumerable achievements each of which has paid for itself literally millions of times. Usually no mention is made of the hundreds of routine but none the less exasperating problems which arise each day to harass works managers and for which solutions are immediately forthcoming. Given any problem within reason, a little money and sufficient time, industrial research will confidently promise to deliver the goods. Furthermore, permit technicians to wander on attractive paths leading away from the specific problem at hand and they will occasionally end up in a culde-sac but more often return with unexpected and invaluable industrial marvels.

The validity of these generalizations of the value of industrial research is best demonstrated by examining the activities of an individual group. And no better specimen exists than the laboratory of the Westinghouse Electric & Mfg. Co. Even though research at Westinghouse is not unique, the East Pittsburgh laboratory is particularly outstanding because of its age, physical size, variety of problems investigated, high caliber of technical employees and its enviable record of valuable achievements.

Westinghouse research started with the founder, and investigation of the then mysterious alternating current first led the air-brake's inventor to organize his electric company in 1886. Subsequent research was a somewhat glorified offshoot of the insulation division, but in 1904 Dr. C. E. Skinner organized a research division of the engineering department and in 1916 this division was isolated from the plant and centralized in new buildings about one mile from the main plant. The laboratories were extended to about 2½ times the original size in 1930.

Since its inception, research at Westinghouse has probably cost the company about $25,000,000. It should be of interest to examine specific accomplishments and judge whether stockholders received their money's worth.

Inasmuch as the Westinghouse laboratory attacks an average of two new problems daily, no all-

inclusive examination is either desirable or possible. The review which follows necessarily is confined to specific outstanding accomplishments. Furthermore, since THE IRON AGE readers are metallurgically minded, such developments will be emphasized.

EXHIBIT I on the Westinghouse laboratory's roster of successes is an early improvement of magnetic alloys and subsequent commercialization of high-purity silicon steels. Furthermore, within the past five years, silicon steel with grains specifically orientated has received considerable attention and some of this work should soon find commercial application.

Investigation of magnetic alloys was inaugurated in this country 50 years ago by George Westinghouse and was taken over at an early date by Dr. C. E. Skinner. The laboratory's present director and manager, Dr. L. W. Chubb and T. Spooner respectively, brought forth many valuable contributions during the period 1906 to 1915. Subsequently the problems were taken over by Dr. T. D. Yensen, whose findings over the past 20 years have made him famous.

Most electrical devices contain a magnetic alloy. It is imperative that this alloy be as magnetically efficient as human ingenuity can devise, particularly in the case of transformers. For transformers may step-up and step-down the voltage of electrical energy many times while it travels from producer to consumer. Inefficient transformer cores heat up rapidly and drain away electrical energy in a startling manner. Economic waste results, a useless load is imposed on the producers' dynamo and the consumer ultimately pays the bill.

The first commercial transformer in this country was installed in 1886. It was cored with laminated sheets equivalent to the stove-pipe iron of that day. Magnetic losses for iron of this type averaged 4 watts per kg.; later, Swedish iron was used (3.5 watts per kg.); in 1900 Hadfield brought out a silicon steel (2 watts per kg.); in 1906 Westinghouse and American Rolling Mill Co. overcame tremendous melting and rolling difficulties to turn out a 3 to 4 Si-0.1 C steel (1.8 watts per kg.); manufacturing improvements drove transformer losses down slightly lower during the next 10 years; and then Westinghouse set Trygve Yensen on what was to be one of the most patient and one of the most successful of modern researches.

Yensen studied each variable that might affect the result—the grain structure, the percentages of sulphur, oxygen, carbon and phosphorus in the steel. It took Yensen two years alone to develop a sufficiently accurate method of determining carbon content. He concluded that iron was the most ideal magnetic material, but it was imperative to drive the carbon content down and eliminate impurities.

Yensen's transformer alloy today (other workers over the world have also worked in the same direction) analyzes 0.0004 carbon, 3 to 4 silicon, and sulphur down to 0.0005. Indications are that this iron will reduce magnetic losses to well below 1 watt per kg.

Westinghouse's magnetic experimentation is the continuing type, and will probably go on indefinitely. All research cost to date probably amounts to well over $1,000,000. If the electrical industry today had to use the alloy Dr. Yensen had in 1920, the additional energy loss for the 15-year period would have cost $135,000,000. If the iron of 1900 had been used up to the present time, over $1,000,000,000 of additional energy would have been dissipated into the air as useless heat. Westinghouse shared only to a minute degree in this saving. The remainder represents what was not taken from the consumer's pocketbook. If this work had never been done, the average citizen would probably not have his electric irons, lights, refrigerators, etc.

Dr. Yensen is now looking into the effect of included CO and CO_2 gases. By rolling his Hipersil to secure preferred orientation of the grain, he hopes to drop magnetic losses by another 20 per cent. Dr. Bitter, at one time Dr. Yensen's associate, is currently floating magnetic colloidal solutions on iron crystals to determine the one basic question—why is iron magnetic? When this question is solved, the patient, plodding exploration necessary in the past may be changed to a swift, certain advance.

EXHIBIT II at Westinghouse is Cupaloy, a "tempered" copper. This research was motivated by the desire to secure a high-electrical-conductivity alloy, as hard as steel, to be used for tips and disks for welding equipment. Cupaloy has a life of 300,000 welds, as compared with 20,000 welds for work-hardened copper. Furthermore, it has been used to considerable advantage for automobile cylinder heads, and, although it is still an infant alloy, potential industrial applications are many and varied.

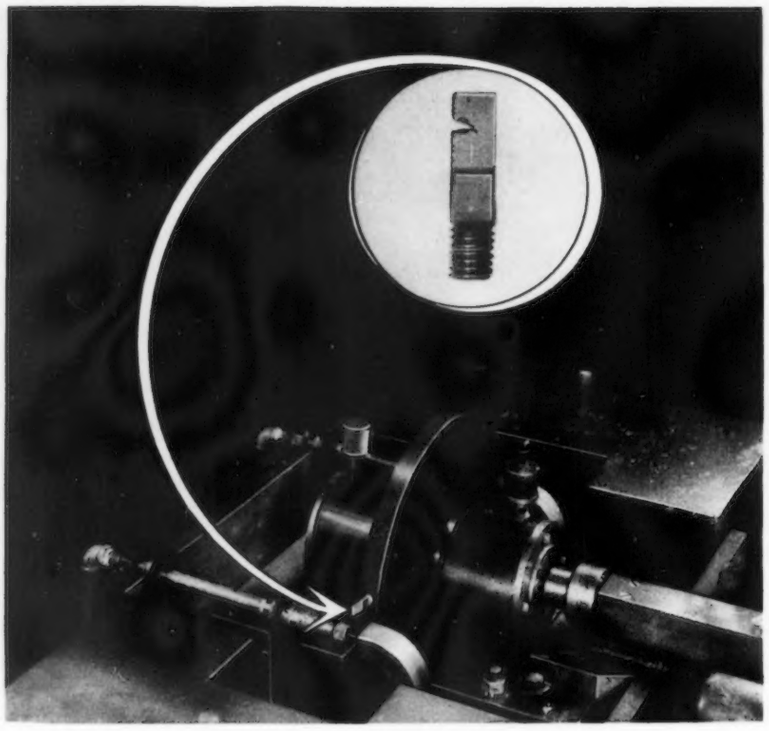
The average layman stands in awe of modern science but inevitably mentions the current inability to produce "tempered copper" comparable to the edged implements which archeologists dig from ancient tombs. The layman fails to consider that these samples have high tin or tin and iron contents, cannot rightfully be considered copper and display few of the characteristics of copper. Furthermore, the layman is ignorant of Cupaloy, which is essentially copper in every respect but one—it can be tempered to such a hardness that a bar of it will indent structural steel under sufficient pressure.

Cupaloy was brought forth several years ago under the tutelage of Westinghouse's metallurgist, P. H. Brace. Of the hundreds of alloying variables tried, small amounts of silver and chromium were found best to secure hardness without loss of electrical conductivity. The result was an alloy having over 99 per cent copper, and the remainder made up of chromium and silver in the approximate ratio of eight to one. Heat-treated Cupaloy tests 75,000 lb. per sq. in. in a tensile machine and its hardness is over 150 Brinell. The electrical and thermal conductivities are 90 per cent that of pure copper, and prolonged heating at a temperature high enough to cause marked alteration of the properties of steel fails to change these values.

Total cost of Westinghouse Cupaloy research was in the neighborhood of $20,000. Over 300,000 lb. of this metal has already been made and sold at an average of 75c. a lb. Its future is very promising. Admittedly it has proved a profitable investment.

EXHIBIT III at Westinghouse is Konal, the "platinum substitute" which performs even better as tube filaments than platinum. Without alloys such as Konal, the inexpensive radio and rectifier tubes of today would be an unfulfilled dream.

Platinum has had its ups and downs since Russia used it for money just to get rid of it and



When hardened steel specimens (insert) are rotated at high speed, a small water jet will eat away the metal in a few minutes. This procedure serves to establish the erosion resistance of various alloys.

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Broadway slickers coated platinum bricks with gold to foist on country yokels. But even before the War, a growing electrical industry had forced platinum prices up until it was the "noblest" of metals, worth more than gold. The situation became really serious about 10 years ago; platinum was difficult to secure at the fabulous price of $186 per oz., nearly six times scrap rate at $107 per oz. the price of gold, and the new-born radio business found its dependence on an expensive metal a serious retarding factor. It was imperative that a substitute be discovered.

Westinghouse's Dr. E. F. Lowry and P. H. Brace took the problem under advisement. Thoriated tungsten was discarded because it reacted adversely with oxide coatings and greatly reduced efficiency. Nickel has good emissive properties, but was pronounced too weak at high temperatures. It was felt that cobalt would give the necessary strength, and a cobalt-nickel ingot was produced. However, it could not be worked into a filament. Dr. Lowry's excellent scientific memory then stood him in good stead. Remembering that he had once seen a length of cobalt would give the nickel the necessary hot strength, then perhaps titanium would make the alloy amenable to fabrication. The result was Westinghouse Konal, which sells at about $1 per oz., and analyzes 73 per cent nickel, 17 cobalt, 7 iron, 2.5 titanium and about 0.4 aluminum. The aluminum has little known influence, and comes into the alloy as an impurity of ferro-titanium.

Konal is remarkably resistant to acids and corrosion, it has a room temperature strength of 102,000 lb. per sq. in. and a strength of 66,000 lb. per sq. in. at 1650 deg. F. As an electron emitter, it is far superior to platinum.

Westinghouse's Konal experimentation cost about $20,000. This alloy theoretically has saved the consuming public an estimated $25,000,000 during the past eight years.

EXHIBIT IV at Westinghouse is alloy K-42-B, which is yet unexploited commercially but which promises to make steam turbines and internal combustion plants more dependable, more efficient and considerably less expensive to maintain in operation. Alloy K-42-B was really sired by Konal. For the development work which led to Konal opened up a new field of strong alloys which have low creep rates at high temperatures and are very resistant to chemical and thermal attack.

These kindred alloys are under the jurisdiction of metallurgist P. H. Brace, at East Pittsburgh, and alloy K-42-B is his answer to the insistent demands of turbine builders for an ideal construction alloy. K-42-B is a complex alloy of nickel, cobalt, iron and other elements. Tensile strength at room temperature is 164,000 lb. per sq. in. and at 1110 deg. F. it is 127,000 lb. per sq. in. It is highly resistant to oxidation and corrosion at high temperatures. Its creep rate is particularly remarkable, being only 0.026 per cent per year when stressed at 60,000 lb. per sq. in. and at 850 deg. F. The rate is 0.0015 per cent per yr. when stressed at 8000 lb. per sq. in. and heated to 1436 deg. F.

The clearance in turbine blading and other high-temperature parts is so small that designers demand a metal which will not distort or creep more than 0.2 per cent in 20 years. Furthermore, tip speed of turbine blading approaches the speed of a bullet, and the metal may be forced to operate near a dull red heat. It takes a good alloy to satisfy these requirements, but K-42-B promises to do the trick.

Research on alloy K-42-B has cost in the neighborhood of $15,000. Theoretical industrial savings are in the future and indeterminable, but will undoubtedly amount to millions of dollars.

EXHIBIT V of Westinghouse research is Kovar, an alloy which has a constant low expansion coefficient over a wide temperature range. Many previous experiments on the expansion characteristics of alloys were brought to a head several years ago when Westinghouse demanded an improved material for use in the Spencer disk thermostat, on which rights had just been secured.

Previously, thermostats had been in the form of bi-metal strips, which performed none too dependably and had a gradual and weak

physical-thermal action. Spencer is said to have hit upon his idea after hearing boiler casing boom when it cooled down. Thereupon, he fastened two disks of steel together (about 2 in. in diameter), and when this assembly reached a certain temperature the center sprung out with considerable speed and force. This disk is used in household electrical equipment to automatically shut off the current when a certain dangerous temperature limit is reached.

The Spencer disk was originally made of Monel metal on one side and 42 per cent nickel steel on the other. It is desirable to have the one metal of low expansibility with heat and the other of high, but with both expansions uniform as the temperature r i s e s. Monel metal and 42 Ni steel were not fully satisfactory, and for this reason Kovar was employed. It analyzes about 29 per cent Nickel, 17 cobalt, 0.2 manganese and the remainder iron. Kovar cold forms much more easily than most austenitic iron base alloys such as 18 and 8 stainless. In the Spencer disk, it is usually balanced against a Ni-Mn-Cr-Fe alloy.

Even though Kovar is used in the Spencer thermostat, its greatest importance arises from the fact that its expansion characteristics were made to conform with the characteristics of hard glass. That is, with rising temperature Kovar first expands slowly and then rapidly. Glass can be fused onto Kovar and the assembly then can be passed from sub-zero temperatures up to the melting point of glass without cracking apart. From this, the recently-announced all-metal r a d i o tube (which is not entirely all metal) became a possibility. Globules of hard glass are fused to Kovar lead wires in the base to provide an insulating and vacuum-proof connection.

Research cost on Kovar is difficult to ascertain, but probably has amounted to about $25,000. Likewise, savings passed on to the consuming public are indeterminable, but undoubtedly overbalance the research cost many thousands of times.

EXHIBIT VI and *ad infinitum* at Westinghouse are too innumerable to mention to further detail. Suffice to say that other metallurgical discoveries number many thousand and vary from a platinum-rhodium die for forming molten glass to a copper-oxide glaze for insulators.

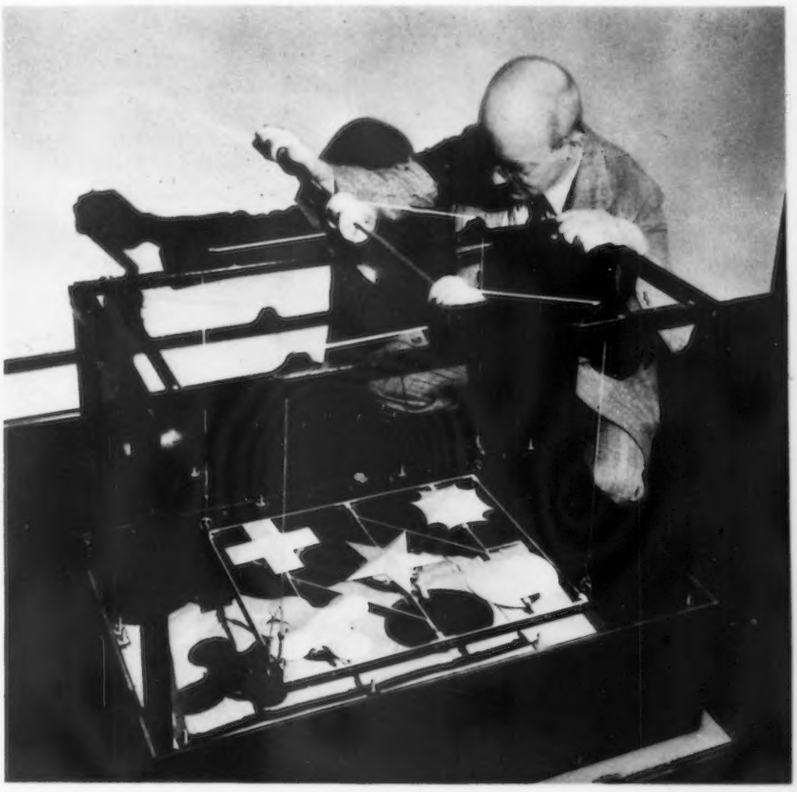
Metallurgical experimenation is merely one chapter in the book of Westinghouse research. At Bloomfield, N. J., technicians are turning out daily marvels to make illumination more satisfactory and more economical. The materials testing division at East Pittsburgh is constantly testing materials for their ability to stand up under prolonged and varying stress. To this division goes credit for solving a tricky little problem of why turbine blades erode and what should be done to prevent it.

Dr. A. Nadai's experiments on the plasticity of metals, although highly theoretical, have been of considerable use to a u t o - b o d y stamping plants in avoiding die designs which overstress fender and body parts and result in heavy scrap losses. Mr. Langer of Westinghouse has studied stresses in railroad tracks and recommended locomotive design changes which have raised safe railroad speeds by 20 per cent and greatly reduced roadbed repair. The laboratories have turned out a dynamic balancing machine which greatly improves and quickens the balancing of rotors for large dynamos and small household appliances.

In the radio and television fields, Westinghouse contributions are innumerable, and work under way promises even greater marvels. Turbine, dynamo and motor research would make a fascinating book. And studies on air conditioning, noise suppression and talking motion pictures have all greatly enhanced the daily lives of people in this country and abroad.

There can be no controversy regarding the p u r e l y economical value of research. Even the few examples mentioned herein show estimated theoretical savings to the human race of well over $1,000,000,000 for an estimated cost of about $1,000,000. This represents a theoretical 50,000 per cent return on the investment. Wall Street would passionately embrace a similar proposition.

Dr. A. Nadai drawing flat steel forms from a sand box. When steel rods which have the same cross section as the flat forms are stressed beyond their elastic limit, the distribution of internal stress is analagous to the convolutions of the sand.







Sympathetic attention to minor as well as major industrial injuries is an important part of modern employe relations as practiced at Westinghouse plants. Recreation, too, is a vital point of common contact between workers and management and fosters the "family spirit" which is beneficial to all concerned.

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SINCE George Westinghouse over 50 years ago first introduced the Saturday half holiday to industry, and knew each of his 200 employees by name, employee relations have been an important factor with the Westinghouse Electric & Mfg. Co. With the advent of modern developments and their intricate problems, a more comprehensive and far-reaching program has been evolved and today at all of the company's various plants we find industrial relations producing tangible and worthwhile results.

A major policy and basic fundamental of all the plans is "keeping the employee informed" upon all things that concern him and his employers. Many items are discussed with employees which were once thought to be the concern of management only. Such procedure has resulted in a closer bond of understanding between both parties.

Industrial relations at Westinghouse have been departmentalized with a distinct and sound functionary setup. The various departments are responsible to the Vice President in charge of Industrial Relations, who directs the formulation of policies. He also acts as advisor to the industrial relations supervisors, one of whom is located at each of the company's plants. Industrial Relations supervisors report directly to the works managers and are responsible to them, thus decentralizing the application of personnel policies so that the activities become a line function instead of staff responsibility.

Carrying out a policy of keeping its employees informed on all matters pertaining to their welfare and that of the company, with discussion of all major points, Westinghouse has found the plan of representation established by employees in 1914, a successful collective bargaining vehicle in addition to fulfilling many other equally important duties. The plan has the full cooperation and confidence of the employees since there has been no attempt on the part of the management to force its opinion on them or to do their thinking. A good example of the cooperation resulting from conferences between representatives and management is shown when it is recalled that in 1933 there were 8000 employees on the payroll receiving some kind of work, who would probably have been unemployed had the personnel been reduced to the point where all work would have been on a full time basis.

Put into effect in 1934, a salary administration plan sets a standard salary policy in all divisions, fixing the relationship between positions of one department and those of another. Normal minimum and maximum salary rates have been established for each position. Yearly departmental reviews are intended to result in an equitable consideration of the wage or salary rate of every employee.

Incentives for hourly paid employees date from 1918. At the present time approximately 90 per cent of all hourly employees work either as individuals or as members of small groups on a standard time basis. Under this plan the employee is assured of a guaranteed minimum rate with an incentive for completing the task in standard time.

Effective May first, Westinghouse Electric & Manufacturing Company and subsidiary companies have extended their present wage and salary plan, based on the earnings of the Company, to include the wages and salaries of all employees. In substance, the plan provides for payment of normal salaries and wages in conformity with the standards of the community and abilities of the employees with uniform increases or deductions dependent upon the increase or decrease of the earnings of the Company. In this way, the total compensation of an employee is, in a sense, tied to the income of the Company.

With minor variations, the salaries and wages paid at present would be justified at an average earnings of $600,000 per month. The plan provides for an increase of one per cent in wages and salaries for each increase of $60,000 in the earnings of the Company over and above $600,000 average monthly earnings. Suitable minimum wages and salaries have been established.

EMPLOYEE RELATIONS

Constant and untiring efforts toward incalculating principles of safety upon each employee have resulted in a gratifying reduction of lost-time accidents since the beginning of safety campaigns. Fifteen years ago it was not uncommon to find the number of lost-time accidents in a plant approaching three figures, whereas today plants often go through an entire year without a lost-time accident. Westinghouse has found that without the help and confidence of the foremen no safety program can hope to succeed.

Much time and research spent on the study and analysis of small or minor accidents has revealed that certain types of employees are accident prone and that many minor accidents are potential lost-time cases. In order to have a successful safety experience, the company must keep the ideas of safe workmanship before the employees at all times, and the important idea that safety constitutes as much a part of the job as skill has been thoroughly impressed upon all workers.

The plan of soliciting suggestions from employees has been in successful operation at Westinghouse since 1910 and has resulted in savings to the company and rewards to employees. Over 66,000 suggestions, ranging in subject matter from new applications to jigs and fixtures, to the health, safety and convenience of workers, have been received. Approximately $94,000 in awards running from $2 to $500 has been paid out for suggestions adopted since the inception of the plan.

During the depression years attention throughout different plants was centered on waste elimination. Various posters and displays were introduced to make the employees conscious of waste resulting from thoughtlessness, improper working methods and disregard of cost problems. Intensive educational programs depicting the cost of small items with actual photographs of wasteful practices have resulted in substantial savings in material costs. These waste elimination drives now constitute a regular feature at all Westinghouse plants.

The development of savings and insurance plans in the Westinghouse company dates from 1917 when it offered to employees the opportunity to purchase Liberty Bonds by payroll deductions. Favorable results as shown by the employees saving through the Liberty Loan plan suggested the establishment of an employees' saving fund which was announced in conjunction with group insurance in February, 1920.

As far back as 1915 a pension plan existed in the Westinghouse companies. Until 1929 the plan was of a non-contributory nature, the company bearing the full cost.

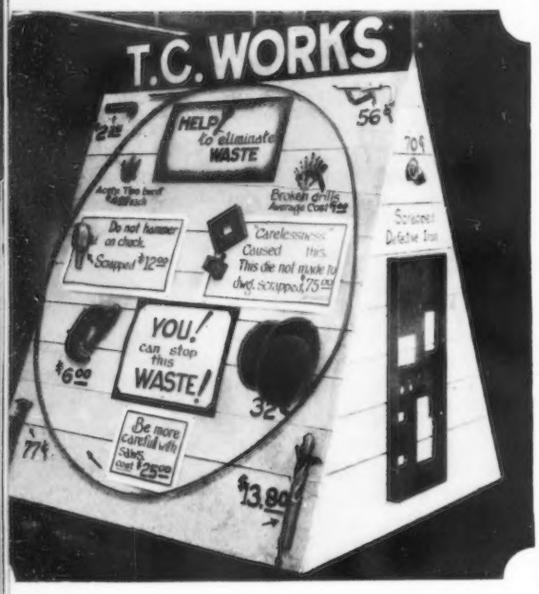
In that year the pension plan was changed to include a schedule gradually reducing the normal retirement age from 70 to 65. Instead of payments being made from operations, a trusteed reserve was set aside and the plan made to consist of two parts. The company provided annuity benefits at no cost to the employee. Employees could purchase, voluntarily, addi-







A part of the company's industrial relations policy, and an important part, is to aid employes to finance the purchase of comfortable homes. The poster idea is a constructive aid to the elimination of waste. Pictorial teaching of safety is made realistic by presenting the actual causes of current accidents. Wages are measured by w



tional annuities, with bonuses granted by the company in cases where the employee, through purchase, matched the company's contributions.

With the advent of the Federal Social Security Act it became necessary for the company to withdraw from the plan. However, continued study is being given the pension problem. Employees may continue the purchase of annuities at favorable group rates.

Employees of Westinghouse, with sound ideas for mutual help, years ago established an employers' sick benefit association. From this organization grew the Relief Department, established in 1907. Benefits for lost time, due to accidents off the job, and death are supported by employee contributions. The company pays for the administration of the plan and matches death benefits. Payments made, exclusive of death gratuities by the company, have amounted to $450,000 since 1907, and the present organization includes approximately 25,263 employees.

Establishment of the relief department necessitated a company physician to examine new applicants. As a result of this move a comprehensive medical program was evolved and today there are 25 physicians and 20 nurses in Westinghouse clinics. With consistent reduction in the number of accidents, the medical department has been able to devote more of its attention to a program of keeping employees fit.

Opportunities for those employees desiring to use their spare time towards increasing their knowledge and usefulness, both to themselves and to the company, have existed at the company's plants for years. Approximately 6000 boys have learned a trade in Westinghouse shops, and while this program was curtailed during the depression, plans are afoot to resume operations.

Attracting students from every civilized country, the Westinghouse Graduate Training Course has been the means whereby more than 8000 graduates of engineering schools have secured their first practical experience in the shops of the larger plants. Candidates are rotated on various jobs and are finally assigned to the position best suited for them.

Starting in 1924 a modern development in the field of training resulted when, through Westinghouse extension courses, studies in new and advanced processes and theories relating to Westinghouse products were established. Employees throughout the entire world have taken advantage of this service.

As a memorial to more than 5000 employees who served during the World War, four annual scholarships were established by the company in 1919. The maximum number of these scholarships in force at any time is 16. Awards are made annually to employees or sons of employees on a competitive basis, each scholarship providing an annual payment of $500 for a period not to exceed four years to be applied toward an engineering education in any technical school selected by the successful candidate. Since the inception of this activity, 62 young









by what they will buy, and food is a large part of the family budget. Efforts to impart scientific principles of food production and conservation are valuable in a broad industrial relations policy.

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men have received college training.

During the past few years, emphasis has been placed on the training of persons already employed. Foremanship, executive and supervisory training and clerical and secretarial studies are available.

Recording employee activities and achievements and affording a means of conveying information concerning the company's policies, practices and products, is the "Westinghouse Magazine," first published in 1914, and approximately 3,000,000 copies have been distributed to date.

Promoting good fellowship, social and educational activities, several different types of employee clubs exist at practically all of the company's plants.

Organized in 1914, membership in the Westinghouse Veterans' Association is available to all men and women having service totaling 20 or more years. Approximately 5000 employees are members of this organization.

Feeling that they had problems in common, assistant foremen and others up to works managers organized the Foremen's Association in 1903, and membership has grown from 150 to more than 600. Besides social and recreational pursuits, dues of members provide death benefits, more than $170,000 having been paid out since the Association was formed.

Drawing its membership from salaried men between the ages of 18 and 50 is the Clerks' Association with approximately 3500 members. Depending upon location, funds for social activities are used in various ways, such as baseball games, corn roasts, picnics and theater parties. With part of the dues going for death benefits, approximately $30,000 has been disbursed annually.

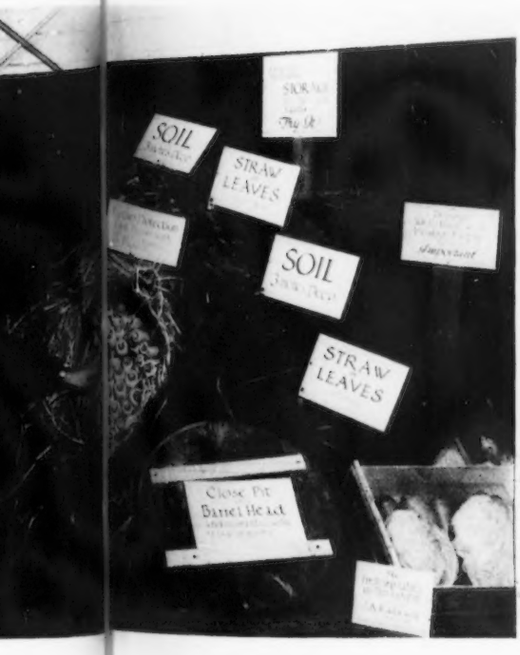
Realizing the beneficial results of vacations for hourly workers, Westinghouse in 1917 inaugurated a plan granting two weeks' vacation to 20-year hourly workers who were members of the Veterans' Association. In 1920 the plan was extended to provide one week's vacation for 10-year hourly employees. Salaried employees with one year or more of service have been granted two weeks' vacation since the company's organization.



Purchase of homes by payroll deduction at a monthly rate comparable to rent has been provided by Westinghouse for employees at several plant locations. Seven hundred homes having an approximate value of $3,900,000 have been completed.

This is the history of the Westinghouse industrial relations program, whose cost to the company has been nearly $23,000,000 since the first plans were adopted. It is likewise the history of the development of the Westinghouse Electric & Mfg. Co., for only so far as the individual relationship of an organization progresses does the organization itself progress.

In the words of Mr. W. G. Marshall, vice-president in charge of industrial relations, "The progress and success of our industrial relations program has proved that it is an aid to management, to be used wisely and intelligently, if the best results are to be obtained."

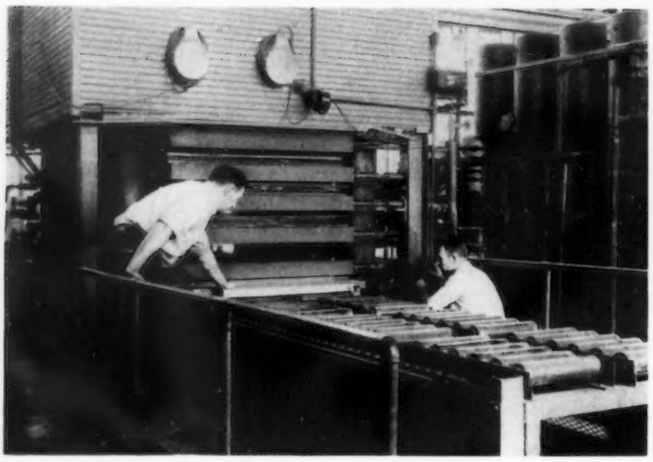




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BELOW

Winding cloth-impregnated gear stock on edge to form the rim. The reel from which the material is fed is mounted in an insulated housing slightly warmed electrically so as to make the material more flexible. In a preceding operation in a punch press, notches are formed in the strip to facilitate edge winding. The hub and web of the gear are molded from chopped-up laminations.



AT LEFT

Curing Micarta board in a large molding press. Through the use of multiple steam-heated platens, the production of a single press is greatly increased. Unit pressures up to 3000 lb. per sq. in. is applied hydraulically and steam temperatures run up to 200 deg. C.

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PLASTICS AT

ACTIVITIES at the Trafford plant of Westinghouse have to do with the manufacture of laminated plastics under the trade name "Micarta." The plant combines a raw materials manufacturing unit together with a fabricating section. About 80 per cent of the product of the Trafford plant leaves in the form of sheets. The rest is in tubing, rods, angles and panels, together with fabricated parts such as gears, rayon spinning buckets and roll neck bearings for steel mills.

Micarta is made either of paper

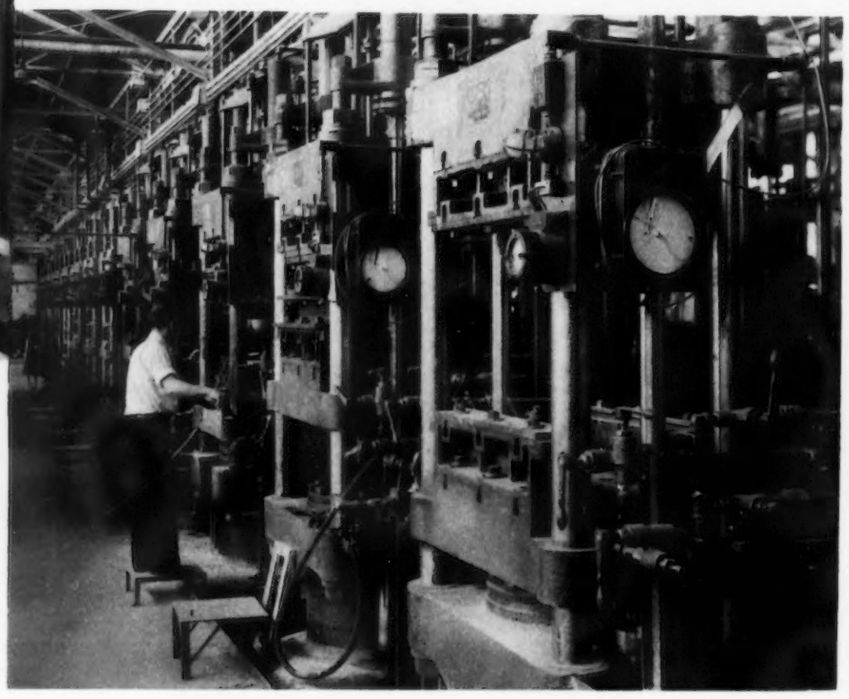


ABOVE

Milling operation on a steel mill roll neck Micarta bearing.

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Battery of laminated plastic molding presses at the Trafford Micarta works. Over 600,000 lb. of process steam is used daily to heat the platens of these presses, which incorporate automatic time and temperature control.



AT RIGHT

Battery of high-speed wood working machines adapted for grooving operations on the breaker strip for refrigerator doors, the material being black paper-base odorless Micarta. The work is carried past the forming cutters on a power-driven chain, and the tools are tipped to withstand the abrasive action and heat at 3000 r.p.m.

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BELOW

Molding a 27-in. diameter steel mill roll neck Micarta bearing in a hydraulic press. Laminating material is a strong fabric. Since these bearings are pre-formed to shape, only a few minor milling operations are required to complete the bearing section.



AT *Micarta Works*

or cloth treated with synthetic resin varnish. Hence a part of the activities here is concerned with chemical process control. The paper or cloth comes in rolls and is run through a bath of resin varnish, then dried in either vertical or horizontal towers. Tubing is made by winding varnish-coated paper around a heated mandrel under pressure. Sheets or boards are composed of a series of laminations of treated paper or cloth compressed between metal platens under high pressure and temperatures running up to 200 deg. C. A

Battery of vertical drying towers used to evaporate the solvent from the resin varnish after it is applied to the paper or cloth. Precise control of the speed of the cloth, the air flow over it and the temperature of the ovens is obtained to assure proper consistency of the raw material entering laminated molded products.

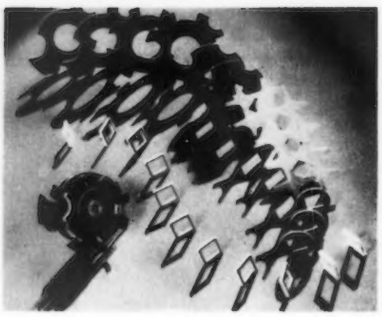




ABOVE

Operations on laminated plastic material are carried on in the same type of equipment used for cutting metal. The illustration shows drilling and counterboring operations on the hub of a rayon spinning bucket chucked in a turret lathe.

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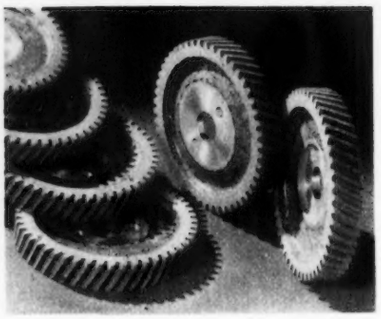
Switch assembly parts of Micarta.

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Micarta coil supports for radio use.

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Micarta timing gears for automotive use.

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battery of triplex plunger pumps with accumulators supplies the hydraulic pressure for the presses at unit pressures up to 3000 lb. per sq. in. and steam is used to heat the platens. Over 600,000 lb. of processed steam is used per day in this plant.

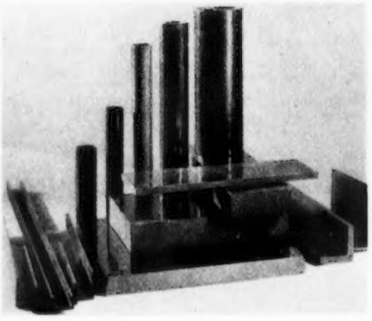
Fabrication of Micarta parts in standard shapes is performed in machine tools commonly seen in the metal-working industry, such as drill presses, turret lathes, milling machines and punch presses. Many complicated pieces can be molded directly to s h a p e using chopped-up laminating material as the molding compound. Multiple dies are sometimes used to increase the output of a single press.

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Decorative table top of paper-base Micarta.

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Assortment of Micarta pieces.

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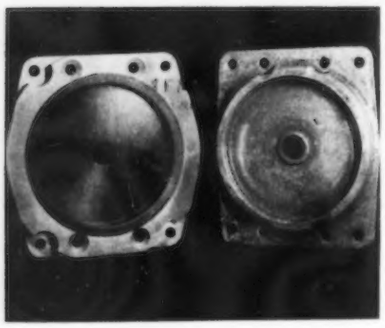


Roll neck bearings.

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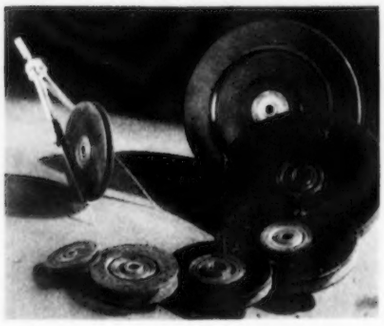
BELOW

Center plate for railway truck.

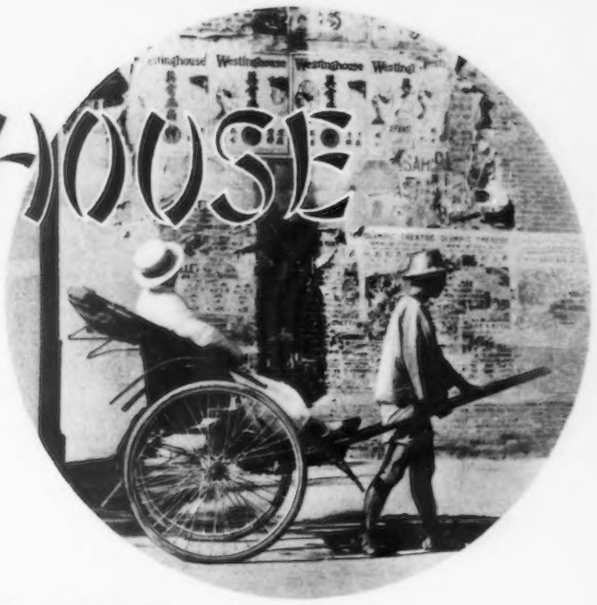


BELOW

Micarta pulleys with sealed-in ball bearing for aircraft control wires.



WESTINGHOUSE ABROAD





In Osaka, Japan, this attractive restaurant is kept cool by Westinghouse fans suspended from the ceiling.

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NO account of Westinghouse activities would be complete without the mention of Westinghouse activities a b r o a d. For the "lines of force" originally emanating from Pittsburgh have been extended, during the past 50 years, until they encircle the globe.

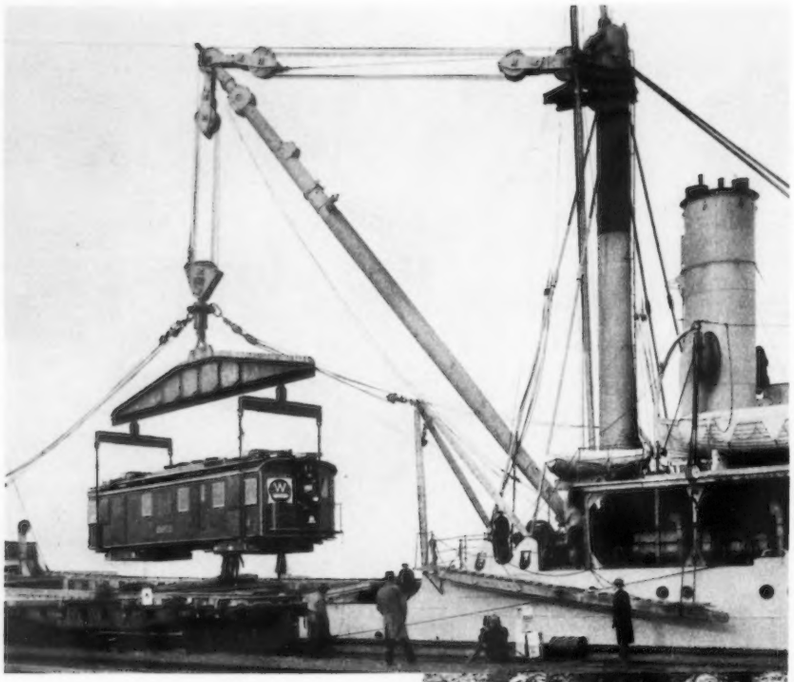
Perhaps you may engage a "rickshaw" in Shanghai, China. In all probability the coolie who furnishes your motive power will conduct you past a street sign advising the purchase of a Westinghouse fan. If you are hungry in Osaka, Japan, you may very likely enter the "Izumoya," a national restaurant which is kept cool by Westinghouse fans. In Caracas, Venezuela, your automobile may cross the El Cuno bridge, lighted by Westinghouse, or tour the smooth pavements of Carabobo park which is similarly illuminated. In Soerabaya, Dutch East Indies, on the occasion of the famous flower festival, you might observe a Westinghouse floral float, featuring automatic refrigeration, as a part of the impressive parade.

Follow the adventurous trail of the "China Clipper" in its tour of the Pacific. At night you will stop at island way stations in which



The Chinese seem to have something to say about trade in Soerabaya, but the store equipment of this Eastern commissary has an American flavor.

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Part of a single seven-million dollar order for the Chilean State Railway electrification being loaded at Philadelphia for Valparaiso. The contract included five substations, seven switching locomotives, 15 freight locomotives, 17 passenger locomotives and 144 miles of overhead line material.

AT RIGHT

Electric power and light must go places where railroads and roads have not gone as yet. Hence, these laboring oxen carrying Westinghouse apparatus parts in the wilds of Honduras.



your food is kept fresh in Westinghouse electric refrigerators.

From Havana to Siam, from Iceland to Australia, one cannot escape the influence of the diverging lines of force set up in East Pittsburgh by George Westinghouse when, in 1886, he obeyed the great mandate—"Let there be light!"

Outside of its native land, Westinghouse service as represented by branches and distributors covers 79 countries.

Electricity may be said to be a symbol of civilization, but its service and influence reach far beyond the boundaries of civilized society. A 6000-mile trip, covering a period of two months, was required to haul, by tractor through Amazonian jungles, the parts of a turbine generator destined to produce light and power for the remote and altitudinous town of Los Angeles de Sierra, on top of the Andes mountains.

Then, too, there were the electric headlights installed upon the locomotives in Siam for the purpose of revealing elephants upon the track before it became a question of impact between steel and "pachydermis."

Romance in plenty attends the march of electricity into the uncivilized hinterlands. Take, for example, the case of the Westinghouse engineers who had the job of installing a gold mining river dredge in the mountainous interior of New Guinea. Passage through the jungle was impractical because of absence of roads and presence of head hunters. Two airplanes were secured, each capable of carrying 10 tons of cargo. Piece by piece, the apparatus was flown over the mountains from seaport to destination. One of the heaviest pieces, a transformer, had to be cut in half for transportation and welded together afterward. And at the destination, head hunters only were available for common labor and these fellows had to be kept pacified and willing to work by an extremely liberal and constant rations of beer.

Westinghouse experience abroad surely demonstrates the fact that the physical frontiers of technical progress still hold the promise of romance and adventure sought by pioneering spirits.

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BELOW

"Just like a delicatessen at home," even to the canned, bottled and packaged goods, is this food dispensary in the Argentine, in which the Westinghouse electric refrigerator has a prominent part.



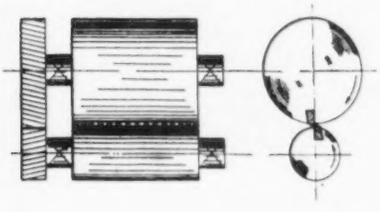
Shearing Strip at High Speed

By H. H. TALBOT

Chief Engineer, United Engineering & Foundry Co., Pittsburgh

THE steady advance in strip-rolling speeds during recent years has necessitated an intensive development of shearing technique. Not only is it necessary to cut sheet from strip as it leaves the mills at speeds as high as 2000 ft. per min., but it is also required that consecutive sheets be held to extremely close length limits.

Both reciprocating and drum-type flying shears have established themselves in the rolling industry. Reciprocating shears are more accurate, but have not as yet been adapted to the high-strip speeds now being used in modern mills. The latest drum-type shears are old in basic principle, as shown



here, but have been improved during recent years until they can now be used in cutting sheets from strip coming from the rolls at speeds ranging from 150 to 2000 ft. per min. Likewise, their accuracy has steadily been improved and it is now possible to cut consecutive sheets accurate in length to within 1/32 in. in some cases and to within ¼ in. at practically any speed.

Drum-type flying shears have five major locations or applications in modern mills. These are at the last stand of the hot mill, at the end of the cold-run table in a hot mill, in the cold-rolled strip cut up line, in connection with the production of skin passed cold-rolled stock and in the production of tin plate. Differences in products and types of applications require modifications in the design of the shears, but the basic principles and advantages are common to all drum-type flying shears.

These units must be compact and sturdy, yet simple and easily accessible with the controls so located that the operator has good visibility and can make changes in cut lengths quickly and easily. Provision must be made to take up back lash due to gear wear so as to assure accuracy of the knife action. Nicking of the strip must be avoided and knife engagement must be readily adjustable.

All flying shears require a "feed" or measuring roll device for feeding the strip to the shear. This device may be a roller leveler, or a pair of pinch rolls; or when the shear follows the last stand of the rolling mill, the work rolls of the mill become the "feed." The length of strip cut therefore depends upon the number of cuts per minute divided into the number of feet of strip fed per minute.

Specially Designed Gears

Cutting speeds and ratios in the United drum-type shears are all controlled through a set of specially designed gears, accurately cut and maintained in accurate and positive alinement by Timken bearings, which handle the thrust developed by the helical gears as well as the radial loading and serve to locate all gear shafts. This gear box is extremely intricate, more than 2000 combinations being provided in some cases, and is the result of years of development. Through it the shear drums are set in motion at the proper speed relative to the speed of the feed rolls to give the desired length of cut by the knives.

For example, assume that cold strip is being fed by the measuring rolls to the shear at a rate of 600 ft. per min. and that it is desired to cut this into 6-ft. lengths. To do this the shear must make 100 cuts per min.

If the strip is cut into 12-ft. lengths, 50 cuts per min. must be

made. This will require a gear-box ratio of twice that for the 6-ft. lengths. Intermediate lengths correspond to the number of cuts per min., or the revolutions per min. of the shear drums relative to the r.p.m. of the feed rolls. Where variations in cut lengths of from 6 in. to 12 in. were formerly acceptable, the gear box on these new flying shears now enables increments of ¼ in. to be made, such as 6 ft. ¼ in., 6 ft. ½ in., 6 ft. ¾ in., etc., and down to 1/32-in. increments if desired.

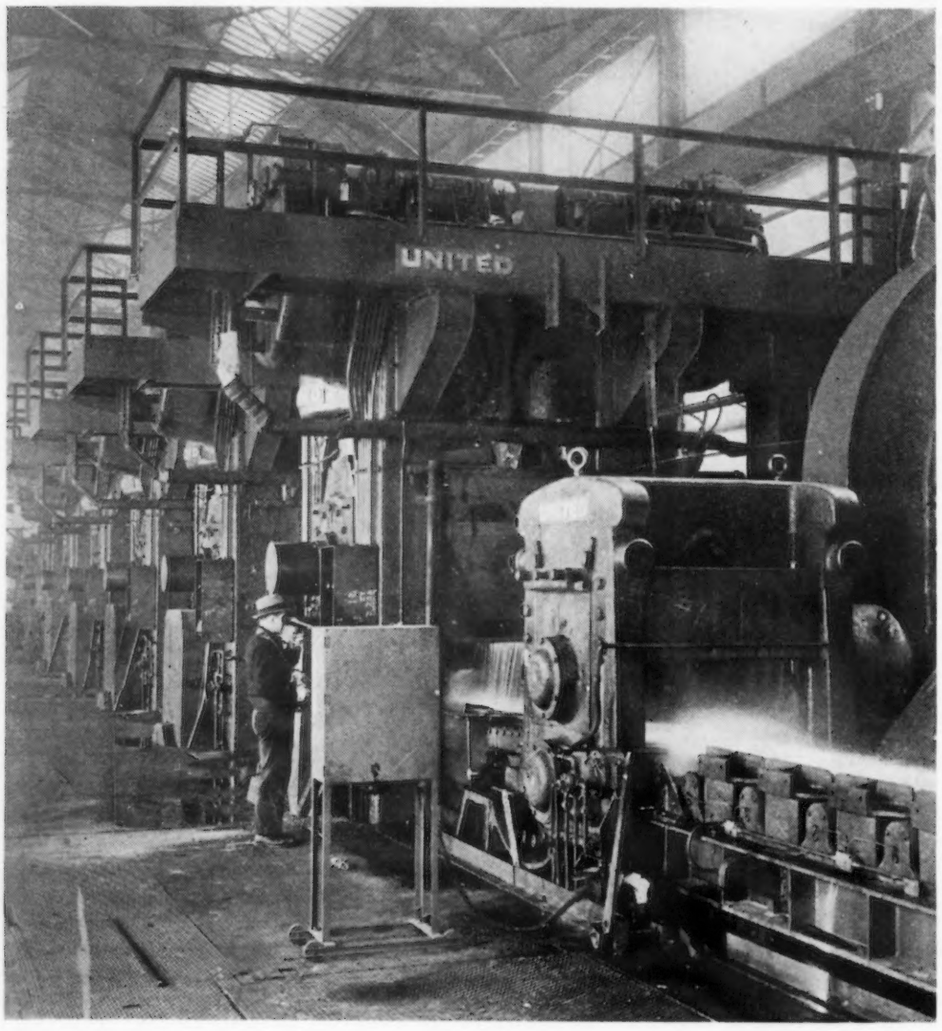
To further explain the action of the shear, assume that the upper drum has a knife circle of 6 ft. and that the bottom drum knife circle has a circumference of 12 ft. This gives a 2:1 ratio for the drums and the meshing drum gears will have pitch diameters the same as the respective diameters of the knife circles. Under such a set-up it will be seen that the top drum makes two revolutions while the bottom drum goes around once, the knives meeting at the second revolution of the top drum. The shear will therefore cut on each revolution of the top drum, so its speed will equal the number of cuts per min.

Therefore, if the bottom drum is revolving at 50 r.p.m. and has a knife circle circumference of 12 ft., the knife speed is 600 ft. per min., which is equal to the speed at which the strip is being fed to the shear. To cut 6-ft. lengths, the bottom drum speed must be 100 r.p.m., giving a "V" speed of 1200 ft. per min., or twice the strip speed. This variation, from the same to twice the strip speed, is about the maximum allowable variation, but it should be remembered that hot strip speeds have increased during recent years until a speed of 2000 ft. per min. is now being used on several mills where United drum-type shears are in service.

Multiplying Ratio Drums

If a second blade was inserted in the bottom drum of the shear, diametrically opposed to the first knife, a cut would be made with each revolution of the top drum and a half revolution of the bottom drum. Using the same speeds as before, sheets could be cut in 3-ft. and 6-ft. lengths. Drum ratios may of course be changed, as for example, 3:2, 4:3, 5:4, etc., giving cuts each third, fourth and fifth revolution of the top drum. Using multiple ratios materially increases the minimum lengths that may be cut on a drum-type flying shear without recourse to objectionably large drums and at the same time keeps the design down to reasonable proportions.

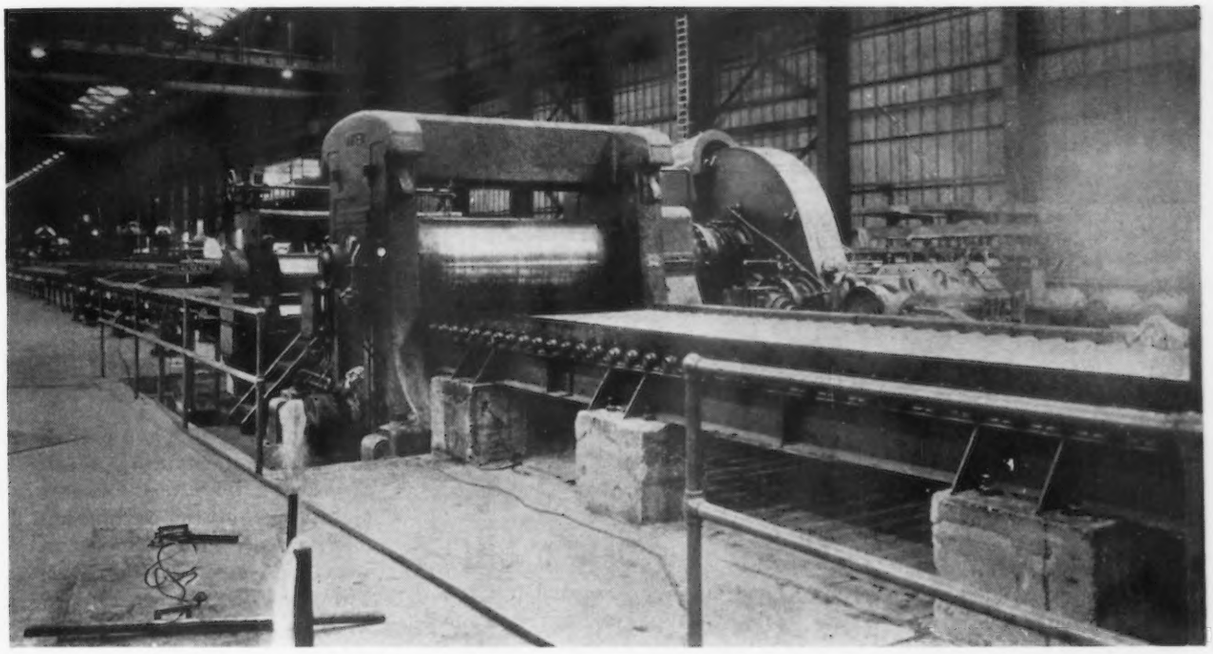
The use of multiple ratio drums introduced another serious prob-



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DRUM type flying shear used at delivery end of 37-in. hot strip mill to crop front or back ends of coils, or to cut sheet lengths.

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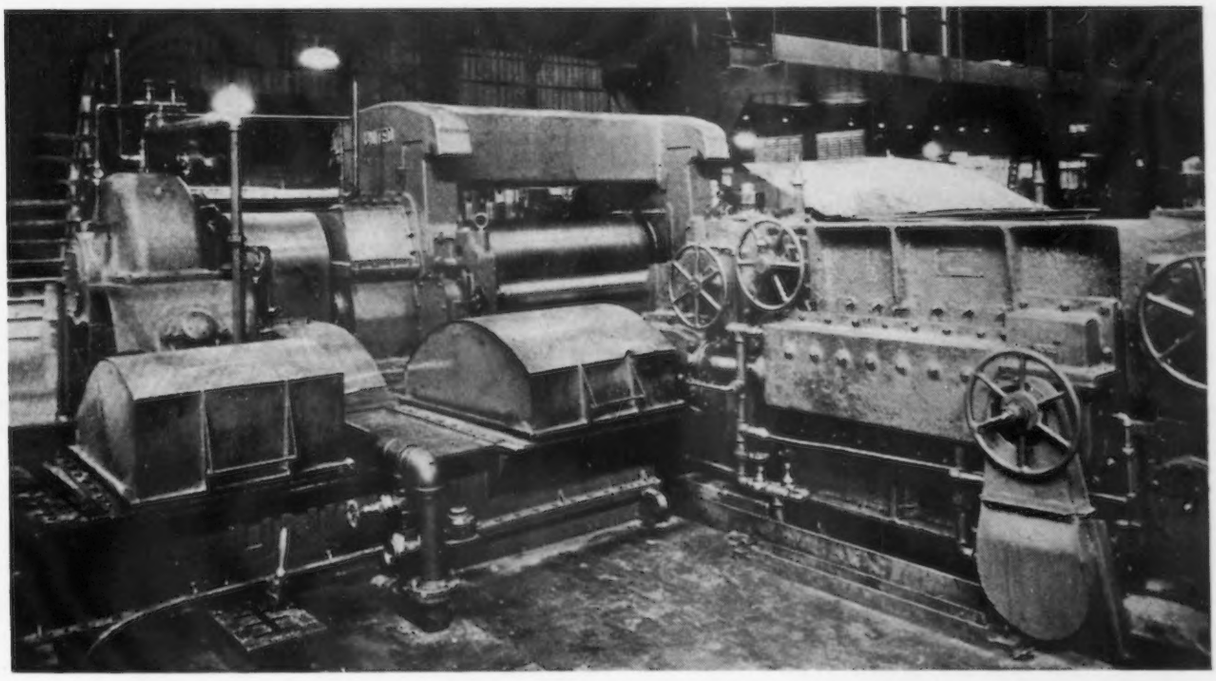
A UNITED 76-in. drum type flying shear located at the end of the cold run table of an 80-in. hot strip mill to crop front ends and to cut from 8 to 20 ft. long in ⅛-in. steps and up to 0.140-in. thick.

lem which had to be overcome before they could be used successfully. As the knife circles are fixed, the tip of each blade always comes to the center of the strip as it passes normally through the shears. Consequently, unless special provision to avoid contact is made, the knives would nick the strip at each non-cutting revolution, producing marred or scrap strip. However, a "non-marking device now functions to flip the strip out of the path of the knives and completely eliminates this difficulty.

Provision must be made in shears of this type for the completion of the cut, as the strip never stops. For example, assume that the cut is completed during ½-in. travel of the strip. When the knife speed is equal to the strip speed, no "yank" or pull occurs. However, if the strip is being cut into 6-ft. lengths, the knives travel twice as fast as does the strip and consequently will travel 1 in. while making the cut. This causes a definite pull of ½ in. and if the strip is restrained, a "draw" or tearing cut will occur.

In the case of cold strip, where

(CONCLUDED ON PAGE 128)



A UNITED 76-in. drum type cold strip shear recently installed to cut strip up to 10 gage and up to 76-in. wide, in steps of ⅛-in. and in lengths from 60 to 172 in. The roller leveler and feed rolls are shown in the foreground.

Improvements in Production

Machine and Equipment for Checking Hourglass Steering Worms

THE Fellows Gear Shaper Co., Springfield, Vt., has recently placed on the market a new type of RED LINER for checking hourglass steering worms. It indicates the amount of clearance between the worm and sector or roller with index lines for each quarter revolution of the worm. This machine operates on the same fundamental principles as the regular RED LINER used for checking external and internal gears, with the exception that it is intended for hand operation only, and it is arranged with a 40 to 1 magnification for English and 50 to 1 for metric measure.

A front view of this machine is shown, Fig. 1. A close view of the hourglass worm being checked and the master roller employed is shown, Fig. 2. Fig. 3 shows how the sector or master roller carrier is centralized with the worm. A ball-point plunger held in the carrier is brought in contact with both sides of the worm thread and this sets the carrier in the correct position for both angle and center distance. A light bulb in the cabinet is provided for illumination to facilitate making this setting and to inspect the location of contact of worm and sector teeth or roller. Two size blocks are employed: one, which is shown in this illustration, sets the carrier at the correct angle; whereas, another size block, not shown, located at the rear of the machine sets the carrier at the correct center distance. A typical chart made on this machine is shown, Fig. 4. It indicates the amount of clearance between the worm and the master roller or sector for each quarter revolution

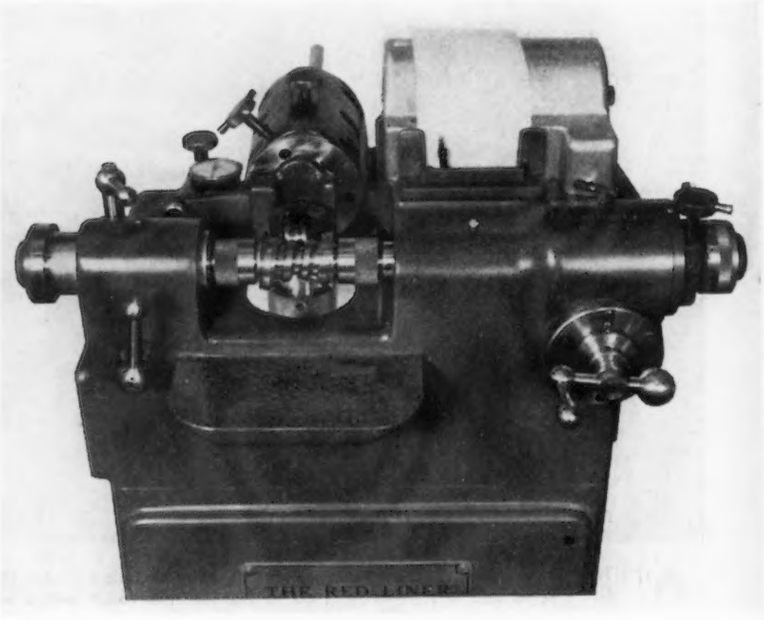


FIG. 1—This front view of a new Fellows equipment, designed exclusively for checking hour-glass steering worms, is supplemented by accompanying close-ups which clarify the operation of an interesting equipment.

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BELOW

FIG. 2—Illustrating the worm and master roller in contact



and Shop Equipment . . .

of the worm. It will be noted that the clearance between the worm and sector increases rapidly after the worm makes one complete revolution. This is to obviate any possibility of the roller or sector binding or cramping in the worm at the extreme ends.

In operation the sector or roller holder is set to the correct center distance and angular position by size blocks, as previously explained, and when a master sector is employed the graduated dial on the operating handle is set at zero. If a master roller, however, is employed, then the graduated dial is rotated 180 deg.

In checking a worm, it is necessary to start either at one end of the worm or the other, depending upon the direction of the helix. The sector holder carrying the master roller or sector is elevated and moved to the end of the worm, then lowered to engage the worm, and the crank handle on the graduated dial rotated in a clockwise direction until the roller reaches the opposite end of the worm. With a 40 to 1 magnification, the distance between the lines on the chart in Fig. 4 represents 0.005 in. For metric measure with a 50 to 1 magnification, this distance represents approximately one millimeter. Maximum capacity is 3 in. pitch diameter.

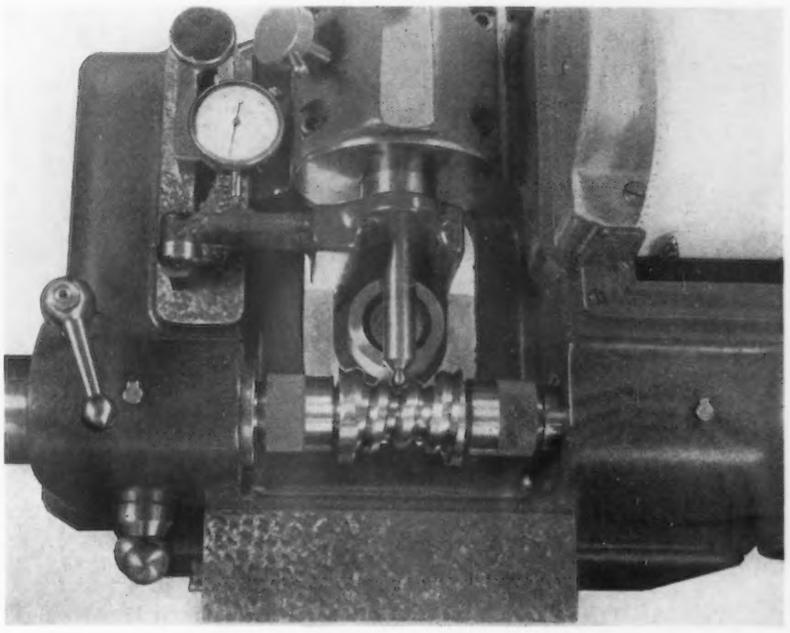
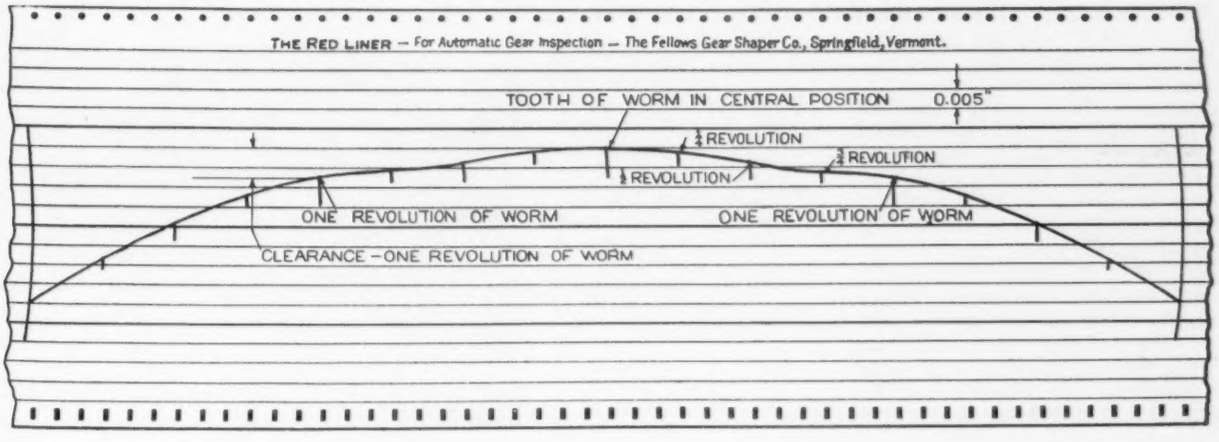


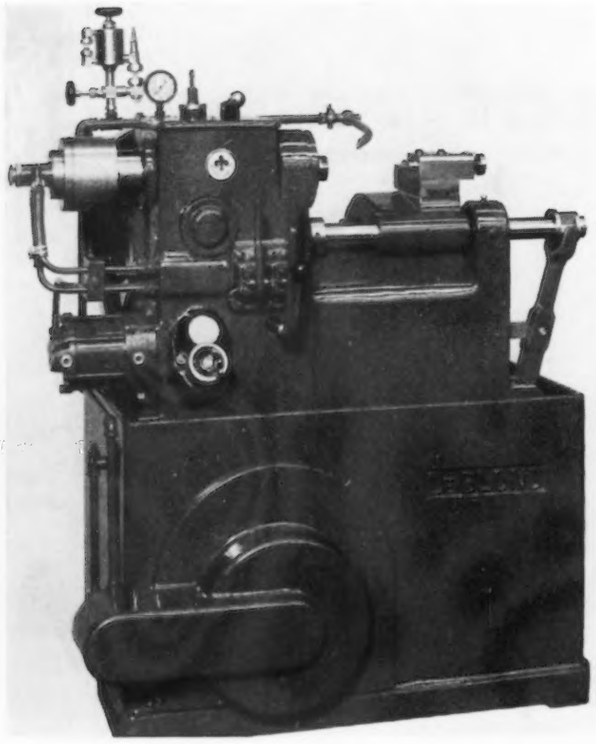
FIG. 3—Pictured details of arrangement for setting master roller or sector carrier at the correct center distance and thread angle

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BELOW

FIG. 4—Reproduction of a Red Line chart which holds the record of the actual checkings. The manner in which this chart is carried is illustrated by its position on a drum at the right on Figs. 1-2-3.





Special Ball Race Groove Turning Machine

A SPECIAL 11-in. lathe by R. K. LeBlond Machine Tool Co., Cincinnati, is adapted to grooving ball races for oil seal and for turning grease retainer grooves in the bore of a ball bearing race. Spindle drive is from a New Departure variable speed unit, up to the drive pulley by V-belts, through a pullmore clutch and brake, then through a right-angle worm drive giving infinite variations from 100 to 600 r.p.m. Cross feed is taken off the clutch shaft; coarse changes being through pick-off gears, and three fine increments through a sliding gear. This provision is for rates of feed of 0.0015 to 0.010 per revolution of spindle. The tool slide is brought up to the working position by air cylinder power and engages the tool slide. The feed cam is carried in the tool arm and engages a clutch in the headstock, giving about ⅛-in. cross feed. After groove turning, a cam and trigger movement reverses the air cylinder moving the slide into loading position. Control levers are shown at the front; an air operated collet functions through the small handle at the left; the larger handle is for moving the slide into working position and engaging the feed; the ball handle is an emergency trip for withdrawing the tool arm at any point in the cycle of operations. Spindle drive is anti-friction mounted, oil flooded by a piston pump every cycle. Coolant pump is driven from the constant speed end of the variable speed unit, pumping from a base reservoir.

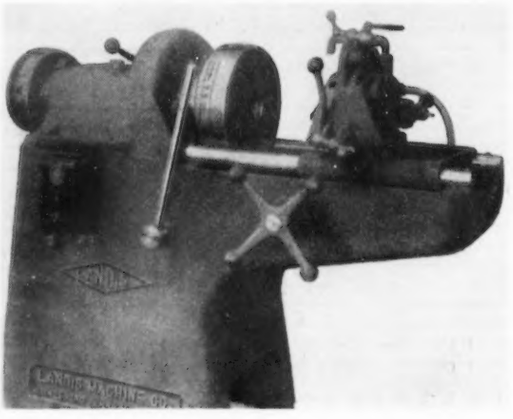
Chucking Equipment For Pipe Threaders

A REAR centering chuck for 2-in. little Landis pipe threading and cutting machines can be applied to machines now in operation. A companion, lever operated, front chuck, is a built-in mechanism and can not be applied to old machines. Both are a development by the Landis Machine Co., Waynesboro, Pa. The lever operated chuck has a universal adjustment for size and can be changed for any diameter, ¼ to ½-in. pipe, by the action of one locking nut; graduations are provided for all pipe diameters. The rear chuck is of 3-jaw universal type and is fitted for knurled ring manual operation rather than by separate wrench. The grip is only for centering and supporting the pipe.

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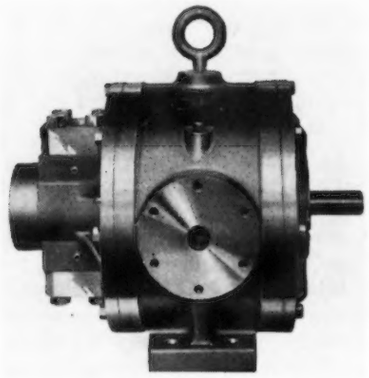
THE work-centering rear member of a new pipe threading chuck equipment can be installed on old machines. The front member is built-in and is available on new machines only.

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Radial Pump Features New Parts Clearance

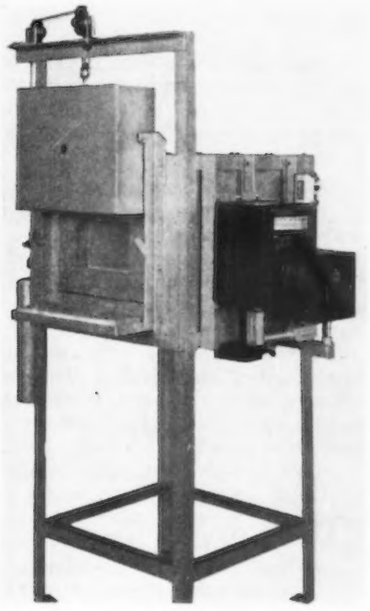
NEW radial pump, design, model 4R, by the Hydraulic Press Mfg. Co., Mount Gilead, Ohio, provides mechanical relationship between valve pintle and cylinder rotor substantially as follows: The cylinder rotor is mounted directly on a stationary central distributing valve pintle through precision bearings having less clearance than the allowable clearance between the two working parts. The bearings are provided with take-up adjustment for maintaining clearance. The design is said to eliminate necessity for fine finishes and de-



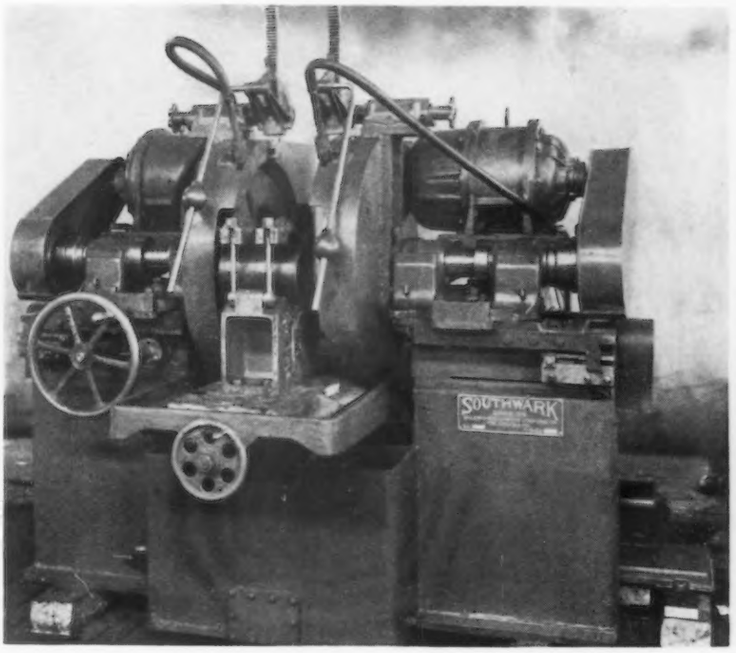
pendence upon oil film as separating factors, and to result in positive positioning of the valve parts. Long tests are said to have demonstrated sustained peak pressures.

High Temperature Muffle Furnaces

NEW high temperature muffle furnaces, announced by H. O. Swoboda, Inc., Pittsburgh, are suitable for operating temperatures up to 2300 deg. F. in the model illustrated. They are equipped with high temperature metallic heating



elements mounted in the hearth roof, side walls and rear. Elements are of wound type substantially supported in grooved refractories which are reversible for forming muffle chambers. Separate muffles, as illustrated, can be supplied if desired. Refractories are backed by three layers of block type high temperature insulation. Inside muffle dimensions are 9 in. wide, 6 in. high, 13 in. deep. Furnace capacity 6 kw. The unit is inclosed in sheet metal. An insulated steel frame door and refractory charging shelf are provided. Automatic control equipment consists of inclosed contactor with push button, Bristol model 478 indicating control pyrometer, instrument potential transformer, and platinum-rhodium thermocouple assembly. Equipments of considerable range are available.



Spring and Flat Surface Grinding Machine

GRINDING machine design for parallel ends on helical springs also permits square surface grinding on any shapes which come within the range of a new machine announced by Baldwin - Southwark Corp., Philadelphia.

The equipment consists of a grinding head with two motors running at the same constant speed and geared to drive spindle-mounted face grinding wheels 22 in. outside by 14 in. inside diameters. Wheels revolve toward the operator and either hand or mechanical feed can be employed to spread or bring them closer together as required.

A motor driven table, with adjustable stroke, travels between the wheels and carries the work pieces. A wheel trueing device is incorporated in the design. Welded construction is employed throughout.

Improved Power Squaring Shears

NIAGARA MACHINE & TOOL WORKS Buffalo, announces a new line of series "BL" power squaring shears with capacities of 10 to 12 gage, and built in 8, 10, and 12 ft. cutting lengths. The shears are of underdrive design, using a very low holddown bar. Crosshead connecting rods run direct from the eccentrics to the crosshead which is of steel in triangular section. Accurate line cutting is provided for through clear observation from the front of the shear between the pressure feet as well as from a position vertically above the cutting edge. An adjustable truss rod provides support for the knife center. Low slope crosshead provides for flat cutting of narrow strips. Operating mechanism is protected from sheared pieces. Gearing is outside of the housing and inclosed. All gears and pinions are hob generated.

Flexible Coupling

CENTER ball principle, plus a rubber cushioned equalized compression drive, furnishes basic design in a new fractional horsepower flexible coupling announced by Certified Flexible Couplings, Inc., 122 East 42nd Street, New York. Two symmetrical forks provide the means for connecting shafts of different sizes. No lubrication is employed.



THIS WEEK ON THE ASSEMBLY LINE



. . . Automobile production maintained as makers expect bonus cash to sustain summer buying.

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. . . Current trend in steel buying leaves little carry-over of low-price material into third quarter.

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. . . Obsolete presses being replaced by modern machinery as Chrysler moves its stamping division.

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. . . Trends in body welding technique indicate big market for gun welders in coming year.

DETROIT, June 23.—With domestic retail deliveries of current models holding up extremely well, particularly in medium-priced cars, a slight increase in automotive production has occurred. Cram's Reports show a rise for the week ended June 20 to 100,733 units, up 318 from the week before. Obviously the issuance of bonus bonds is a factor in sustaining the car market, though it may still be too early to measure the effect of this increase of money in circulation, since the distribution of bonds is hardly completed and their conversion to cash is still going on.

Several months ago the American Legion survey indicated that $623,615,793 would be used by veterans to pay off debts. This, incidentally, is the largest single item listed on the veterans' slate. It is from this money going into circulation that the car manufacturers expect to see the biggest benefit to sales, rather than from direct payment by veterans for cars. Payment of long overdue debts will increase the purchasing power of the butcher, the baker and the candlestick maker to the extent that these groups will enter the market for new and used passenger cars and trucks. It is certainly obvious that the present bonus payment will have a much more stimulating effect than the earlier one made during the Hoover administration, when things generally were on the down grade. Besides, the disbursement in this instance is much larger. The unhealthy factor in the present situation, of course, is the fact that this bonus money, plus payments to farmers against old AAA contracts, as well as WPA and other relief expenditures, all represent money coming out of the U. S. Treasury. No one has said much about what may happen should these latter payments cease, due to a change of administration. Nevertheless, the automotive industry is only too willing to accept what might be coming its way out of the general maw.

One pathetic instance was reported in the press last week of a war veteran who, after being on relief for two years, immediately cashed his bonus check and bought a new car. The real tragedy occurred six hours later, when the veteran wrecked his new car and later died of his injuries. This instance goes to show the tremendous appeal that there is in owning a unit of transportation and that a person's first reaction, when handed a sizable sum of money, seems to be to buy a new car. Certainly this is more likely to be the case when a batch of bonus bonds falls into the hands of a business man who is already comfortably meeting his current expenses.

Although production and sales are being maintained at a high level, most assembly lines are currently operating on a four-day week. Machine shops are being worked on a five-day week in order to build up a bank of motors, transmissions and other components so as to feed the assembly line when the machine shops are later shut down for change-over work. Already it is reported from more than one source that there will be an actual shortage of cars during October. In one plant the date of shut-down has been advanced three times owing to changes in schedule. In this particular instance, the factory has been working against a backlog of orders amounting to four to five weeks' run, yet the motor bank at any time has never been in excess of 2000 units. Obviously such a plant would not shut down for change-over until the

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By FRANK J. OLIVER
Detroit Editor, The Iron Age

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very last possible moment required for making the necessary revisions for 1937.

Steel Buying Approaches Lull

Steel suppliers report that final orders are coming through from many companies on specifications for 1936 cars. Chevrolet made a substantial buy last week that was definitely labeled "end of run". What buying there has been ahead for 1937 models in order to come in under second-quarter prices has been largely limited to the Chrysler Corp. and to parts suppliers. Several parts plants have been ordered by their automotive customers to buy steel ahead at the present price. In some cases the parts plant has been supported to the extent of being given a contract for next model business running up to Jan. 1. In cases where the buying of steel for parts is controlled by the automobile manufacturer himself, the parts plants have been given assurance of a chance of revising prices upward in line with the steel price advances.

As far as the delivery of second-quarter price steel carried over into the third quarter is concerned, Detroit is in a more favorable position to the steel suppliers than most centers. With automotive buying reduced on end-of-the-run needs and with a limited number of specifications out on '37 cars, it has not been possible for the big plants to do much speculative buying ahead. Hence there has been little chance of an argument on the basis of delivery under the old price set-up running into July.

More than one supplier has practically closed his books on orders for second-quarter price steel, and one of the largest suppliers has refused to accept orders for delivery beyond June 30. On the other hand, companies selling structural steel and pipe have indicated that they would accept orders up to the end of the month for delivery at the mills' option, and that the usual protection of 30 days would be granted identified projects. As a result, it is expected that a great deal of the old price tonnage will have been delivered by July 10, and that there will be few hang-overs beyond the 15th.

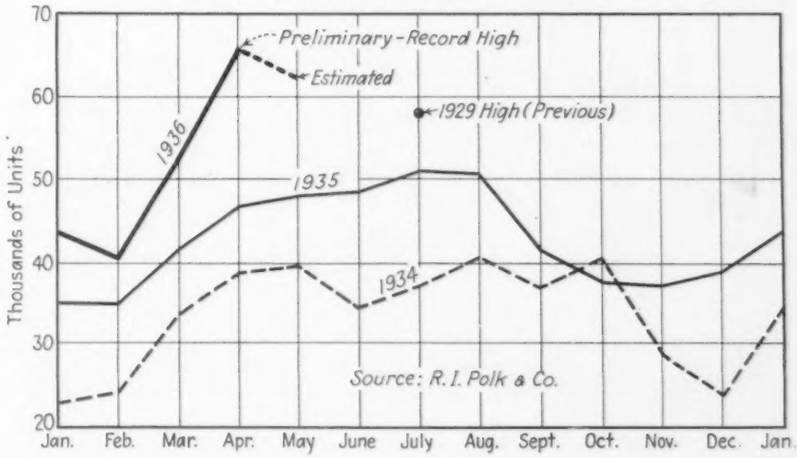
Sales of pig iron are in good volume at this time, despite the approach of the summer shutdowns in the automobile plants. General Motors receives practically all its pig iron for the Chevrolet and Buick foundries by water to Saginaw, so that shipments will continue throughout the summer in order to build up the necessary bank to carry over the winter season. Jobbing foundries that specialize in castings for body dies have been active buyers in the last few weeks and are expected to continue to operate at present capacity for another 30 days. Mill supply houses also report considerable activity among these jobbing shops, which are just beginning to get under way as far as special tools are concerned.

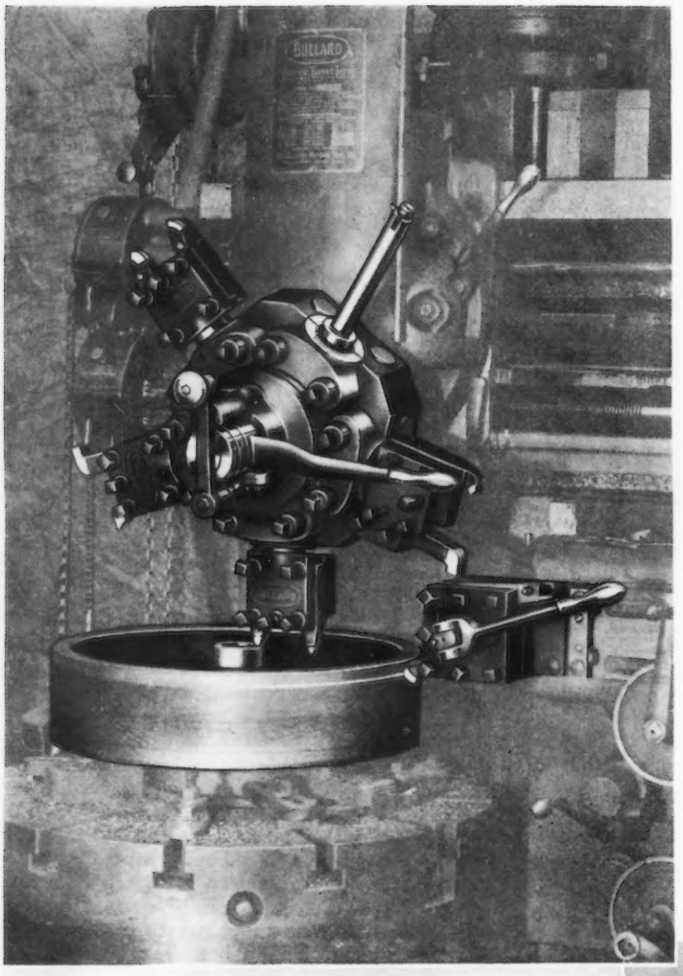
Machinery Purchases Restricted

Most program buying of machine tools is about cleaned up, with the exception of the Buick Motor Co., which has been active in lining up machinery for a new transmission during recent weeks. It is said that this transmission will probably be an automatic type operating on both torque and speed principles and that it will go into the Oldsmobile Eight. Purchase of this machinery confirms earlier rumors that Oldsmobile was to be selected for the initial try-out of automatic transmissions by General Motors. Already some of the gear-cutting equipment has been delivered to the plant, but there is much more to be done on component parts, including the case.

Buying activity on the part of

TRUCK REGISTRATIONS - U. S.





PRODUCING PROFITS—

1—On "Short Run" as well as "Long Run" Jobs.

2—By Simplicity and Versatility of Tool set-up.

3—Through Accuracy with minimum spoilage.

4—Through maintained duplication of limits with minimum required inspection.

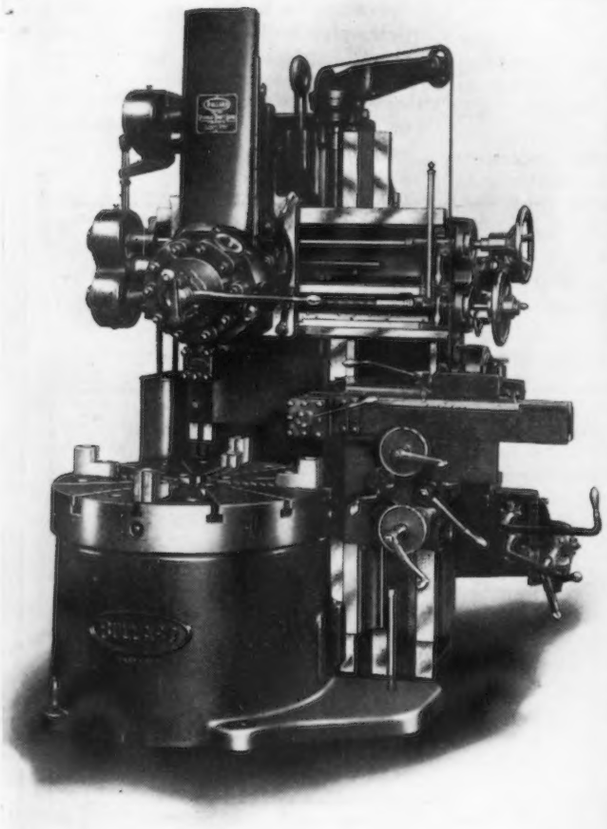
5—With Low Cost of Maintenance.

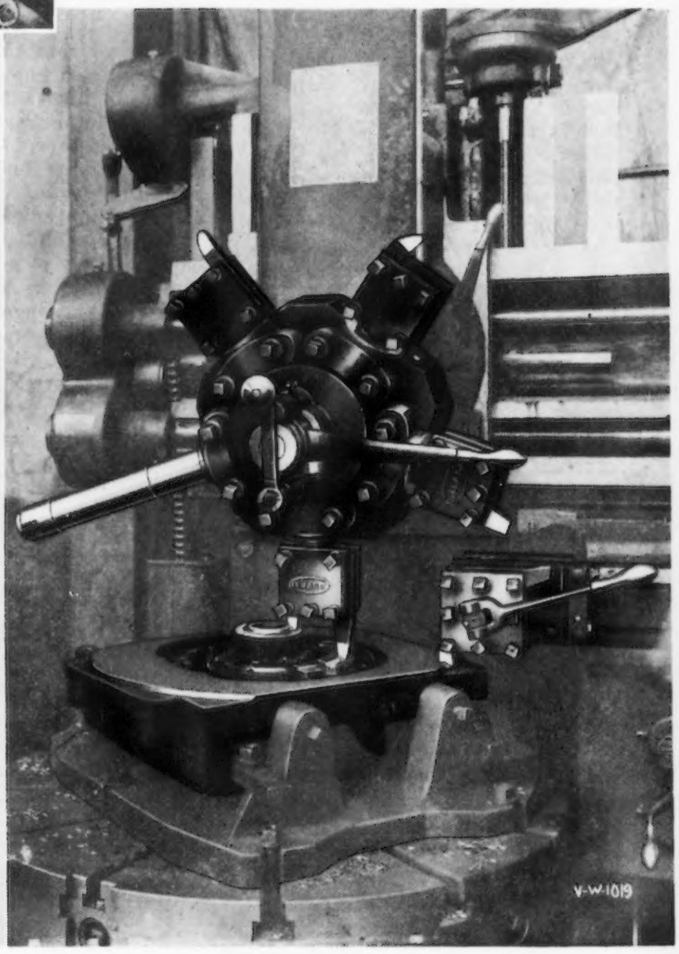
6—From Ease and Rapidity of Operating Control.

The Bullard Vertical Turret Lathe has been developed so that its design and construction cover these points and many others. The result is a machine tool assuring a Profitable Investment.

Bullard Engineers will gladly work with you to Save Costs and Increase Profits. If others Profit, so can you.

THE BULLARD COMPANY
BRIDGEPORT, CONNECTICUT





the Chrysler Corp. is largely centered around the purchase of presses for the new stamping plant being erected beside the Wyoming Avenue plant. This plant, formerly known as the LaSalle plant, was purchased from General Motors about a year ago and has largely been used for export storage. A substantial building is being erected alongside it to house the new presses. To date, about $500,000 has been expended for such equipment, but it is anticipated that twice this amount will have been invested before the program is completed. Most purchases have been to replace obsolete press equipment now at the Dodge main plant so that the relative stamping capacity of the Chrysler Corp. will not be increased to any extent. As before, a great deal of Chrysler stamping work is done on the outside by such companies as Briggs Mfg. Co., which makes both Plymouth and Dodge bodies.

Before long, machinery will be going into the new machine shop now under construction along the east boundary of the Jefferson Avenue plant of Chrysler. This building, which is over 900 feet long, will house the new cylinder block line which is to take care of DeSoto and Chrysler Six engines, as well as the Dodge truck engine. Altogether, this particular project will involve the expenditure of one and a half million dollars. Another big buy made by the Chrysler Corp. during the past few months has been large batteries of Gleason machines for cutting hypoid gears. About the last of these units is going into the Dodge main plant this week. This represents one of the largest single machinery orders on record going to any one company, amounting to $760,000. It looks like small change, however, compared to the $2,000,000 press order involved in the equipment of General Motors' new stamping plant at Grand Rapids. Delivery of these 10 lines of production presses will have been completed in about 30 days.

New Cutting Metal

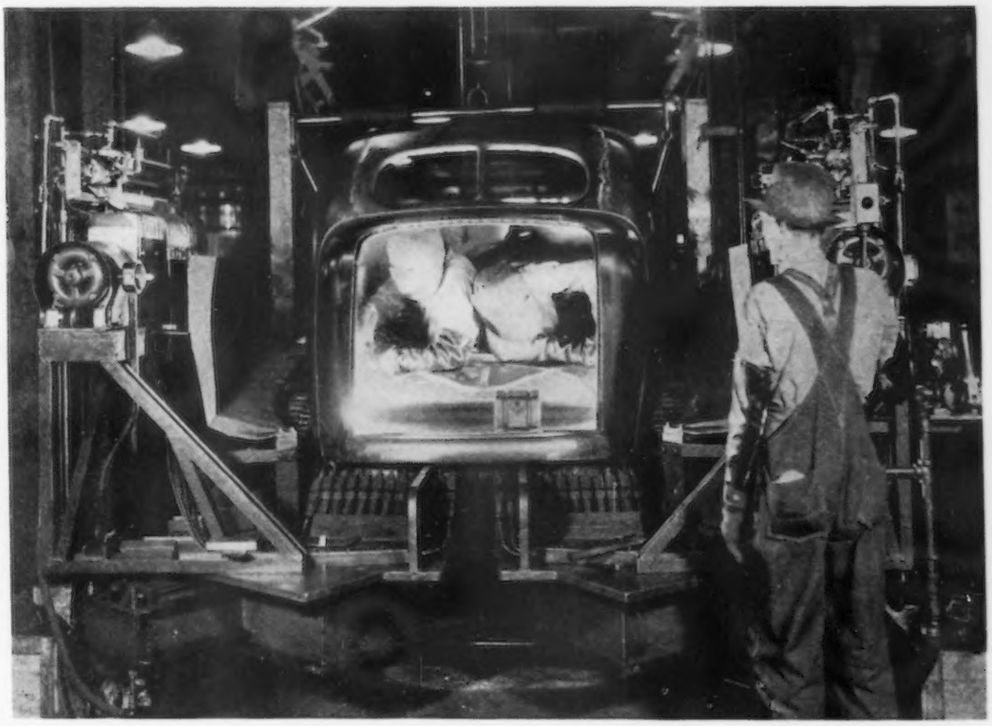
A new cutting metal will soon be introduced, according to reports circulating in this area. Said to fall between the cast and cemented types as to general characteristics, the new cutting alloy is reported to have been undergoing intensive development for the past two years in actual mass production in one of the large automobile plants. It is said to have achieved rather phenomenal results from the point of view of cutting ability, combined with long tool life. What is more interesting, the metal is said to cost only a fraction of that of cemented tungsten carbide. Arrangements are being made at present to place the metal on a large scale production and marketing basis.

Welding Trends

Because welding plays such an important part in body fabrication, Detroit has become the frontier town as far as development in high-production welding techniques are concerned. During the past year a very definite trend has been observed toward the use of spot welders, particularly the portable type known as gun welders, in the fabrication of body panels. Flexibility and adaptability of the equipment are emphasized so as to cut down the expenditures involved in making change-overs each year. Large size flash welders costing up to $75,000 apiece will probably retain for many years their usefulness in welding rear quarter panels to backs, but in other places the gun welder is coming up fast. Chrysler, on the other hand, favors multiple bank, individually controlled spot welders, actuated hydraulically.

It was not more than about five years ago that the first gun welder was developed. Many of them were home-made devices with manual push button control. Now the heart of a gun welder is the control device. Conventional types permitting 150 welds a minute are too slow, however, for the requirements of the automotive industry. It is said that the Fisher Body Corp., for example, has developed a combination pneumatic and electric control that permits from 300 to 400 spots to be made in a minute. In effect, this amounts to a stitch weld. In a control of this kind, air pressure first builds up the necessary contact pressure between the electrodes and the work, and a fraction of a second later an electric switch is thrown by the action of a pressure diaphragm when the back pressure has built up on the line. The cycle continues as long as the operator holds his hand on the control button.

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IN contrast with the general trend toward gun welding, Chrysler Corp. favors the use of multiple automatic spot welders, hydraulically controlled. The photo shows a Hydromatic welder attaching the floor deck to the body of a Chrysler car.

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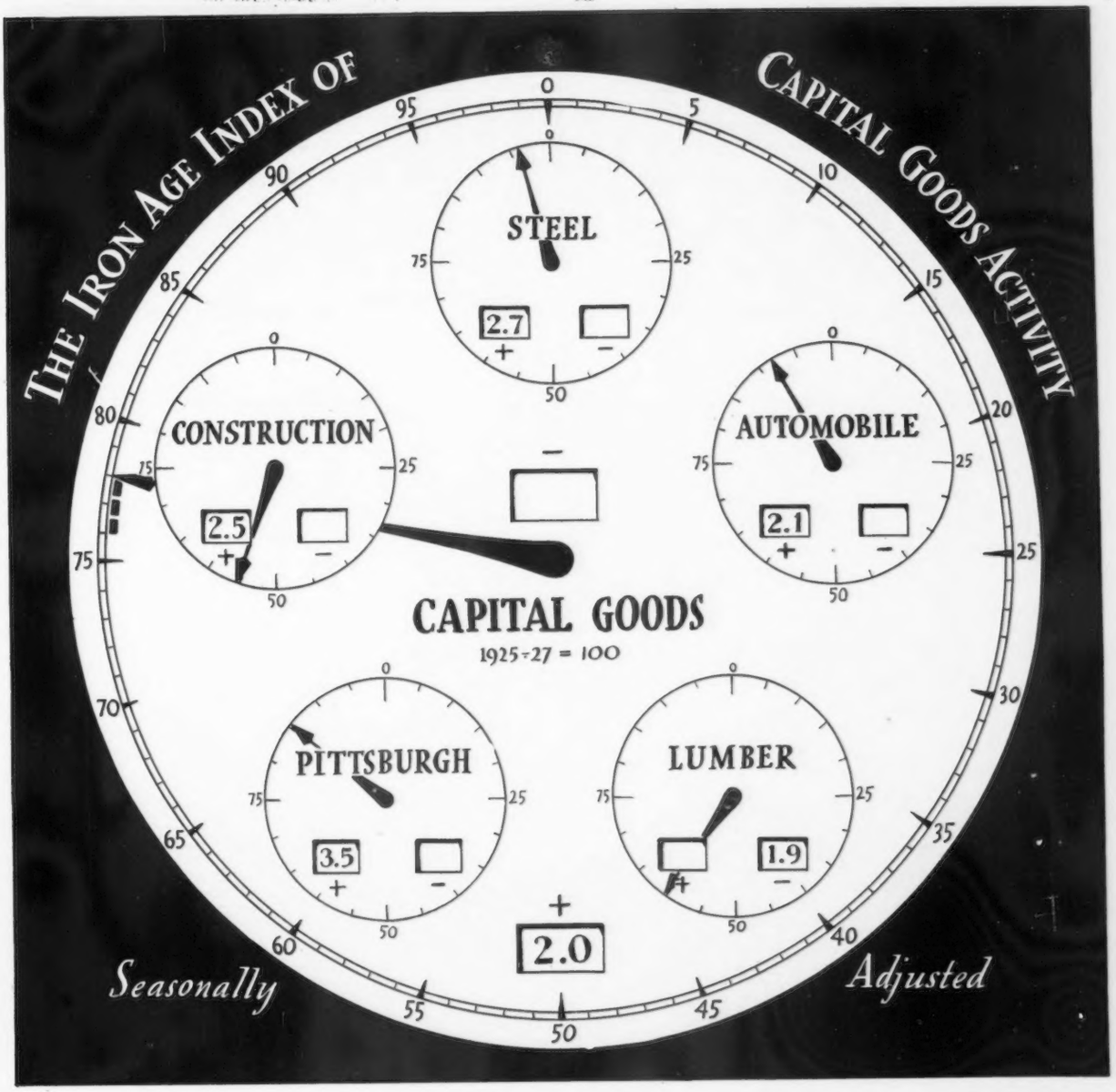
Current Metal Working Activity Statistically Shown

These Data Are Assembled by The Iron Age from Recognized Sources and Are Changed Regularly as More Recent Figures Are Made Available.

	May, 1936	April, 1936	May, 1935	Five Months, 1935	Five Months, 1936
Raw Materials:					
Lake ore consumption (gross tons)[a]	.....	3,485,293	2,466,585	12,157,235	.....
Coke production (net tons)[b]	.....	3,554,617	2,850,236	14,362,635	.....
Pig Iron:					
Pig iron output—monthly (gross tons)[c]	2,648,401	2,403,683	1,727,095	8,246,486	10,887,986
Pig iron output—daily (gross tons)[c]	85,432	80,125	55,713	54,612	71,631
Castings:					
Malleable castings—production (net tons)[d]	.....	50,954	34,729	204,349	.....
Malleable castings—orders (net tons)[d]	.....	47,933	31,136	194,560	.....
Steel castings—production (net tons)[d]	.....	63,087	30,646	153,260	.....
Steel castings—orders (net tons)[d]	.....	83,188	29,083	152,113	.....
Steel Ingots:					
Steel ingot production—monthly (gross tons)[e]	4,046,253	3,942,254	2,633,661	13,783,987	17,341,490
Steel ingot production—daily (gross tons)[e]	155,625	151,625	97,543	106,031	133,396
Steel ingot production—per cent of capacity[e]	70.91	69.09	44.06	47.90	60.78
Finished Steel:					
Trackwork shipments (net tons)[e]	7,314	7,031	4,228	17,365	28,085
Steel rail orders (gross tons)[e]	8,800	150,057	28,215	252,807	556,148
Sheet steel sales (net tons)[f]	.....	190,269	149,725	1,016,028	.....
Sheet steel production (net tons)[g]	.....	217,975	191,507	1,082,584	.....
Fabricated shape orders (net tons)[g]	.....	101,614	60,448	398,300	.....
Fabricated shape shipments (net tons)[g]	.....	124,044	84,115	413,030	.....
Fabricated plate orders (net tons)[d]	.....	29,900	17,630	81,548	.....
Reinforcing bar awards (net tons)[e]	19,725	26,700	12,080	99,920	162,090
U. S. Steel Corp. shipments (tons)[h]	984,097	979,907	598,915	2,975,891	4,145,285
Ohio River steel shipments (net tons)[i]	86,004	74,110	78,106	328,028	356,166
Fabricated Products:					
Automobile production, U. S. and Canada[k]	.....	527,726	385,427	1,996,180	.....
Construction contracts, 37 Eastern States[l]	.....	*$234,631,600	$126,720,100	$548,501,600	.....
Steel barrel shipments (number)[d]	.....	730,099	554,102	2,531,234	.....
Steel furniture shipments (dollars)[d]	.....	$1,633,633	$1,214,163	$5,761,399	.....
Steel boiler orders (sq. ft.)[d]	.....	783,961	643,154	2,281,288	.....
Locomotive orders (number)[m]	10	15	2	13	98
Freight car orders (number)[m]	9,677	3,650	2	1,432	22,234
Machine tool index[n]	118.9	125.7	73.3	†67.1	†116.6
Foundry equipment index[o]	165.4	134.0	100.7	†94.4	†138.1
Foreign Trade:					
Total iron and steel imports (gross tons)[p]	.....	49,277	47,719	149,683	.....
Imports of pig iron (gross tons)[p]	.....	11,982	23,174	46,903	.....
Imports of all rolled steel (gross tons)[p]	.....	23,847	18,939	73,294	.....
Total iron and steel exports (gross tons)[p]	.....	301,987	286,599	1,306,247	.....
Exports of all rolled steel (gross tons)[p]	.....	101,522	62,161	345,994	.....
Exports of finished steel (gross tons)[p]	.....	90,116	56,612	304,462	.....
Exports of scrap (gross tons)[p]	.....	190,845	209,425	900,844	.....
British Production:					
British pig iron production (gross tons)[r]	661,000	629,800	558,900	2,643,700	3,105,000
British steel ingot production (gross tons)[r]	963,000	*984,200	853,300	4,031,200	4,778,300
Non-Ferrous Metals:					
Lead production (net tons)[s]	.....	38,073	37,358	159,477	.....
Lead shipments (net tons)[s]	.....	40,457	32,341	168,454	.....
Zinc production (net tons)[t]	44,905	43,252	34,572	175,239	208,785
Zinc shipments (net tons)[t]	43,977	42,311	35,627	185,619	210,833
Deliveries of tin (gross tons)[v]	5,235	6,235	3,950	23,775	29,225

* Revised. † Three months' average.

Source of figures [a] Lake Superior Iron Ore Association; [b] Bureau of Mines; [c] THE IRON AGE; [d] Bureau of the Census; [e] American Iron and Steel Institute; [f] National Association of Flat-Rolled Steel Manufacturers; [g] American Institute of Steel Construction; [h] United States Steel Corp.; [i] United States Engineer, Pittsburgh; [k] When preliminary, from Automobile Manufacturers Association—Final figures from Bureau of the Census; [l] F. W. Dodge Corp.; [m] *Railway Age;* [n] National Machine Tool Builders Association; [o] Foundry Equipment Manufacturers Association; [p] Department of Commerce; [r] British Iron and Steel Federation; [s] American Bureau of Metal Statistics; [t] American Zinc Institute, Inc.; [v] New York Commodities Exchange.



Same Week Last Month	*Preceding Week*	*Last Week*		*Same Week 1935*	*Same Week 1934*	*Same Week 1933*
75.5	**76.0**	**78.0**	**COMBINED INDEX**	**55.5**	**61.0**	**55.0**
87.9	93.5	96.2	Steel Ingot Production	52.9	76.2	69.5
93.9	89.8	91.9	Automobile Production	83.5	64.0	53.5
58.7	62.0	60.1	Lumber Shipments	46.9	53.3	56.3
82.3	81.9	85.4	Pittsburgh Industrial Production	55.9	74.1	64.4
53.8	53.2	55.7	Heavy Engineering Construction	38.8	36.5	30.3

AFTER remaining unchanged for two weeks, business activity in certain selected heavy goods industries has given evidence of an unusual spurt, according to THE IRON AGE weekly index of capital goods activity. The latest showing for the index is 78.0 per cent of average industrial conditions prevailing in the 1925-27 base period. Since the previous week's figure was 76.0 per cent, a rise of fully 2.0 points has occurred in this comparatively short period of time. This is unusual. Advances made by the separate indices combining to form the capital goods barometer were partly accounted for by seasonal adjustments. But gains in actual volume were impressive, as in the case of steel mill activity wherein operations expanded to 71 per cent of capacity. Output of motor cars also increased last week, though in terms of actual volume the gain was but slight. In the important Pittsburgh industrial district, latest index reports indicate that almost all branches of the iron and steel industry have increased working schedules, and shipments of heavy products are likewise momentous. Another factor, the index measuring heavy engineering construction in progress has mounted.

All in all, comparable periods during the past three years fail by a wide margin to come up to the recent record of industrial activity as measured by THE IRON AGE's index. At this time in 1935 the index was 22½ points lower, 17 points lower in 1934 and 23 points lower in 1933.

Components of The Index (1) Steel Ingot Production Rate, from THE IRON AGE; (2) Automobile Production, from Cram's Reports, Inc.; (3) Revenue Freight Carloadings of Forest Products, from Association of American Railroads; (4) Industrial Productive Activity in Pittsburgh District, from Bureau of Business Research of University of Pittsburgh; (5) Heavy Construction Contract Awards, from *Engineering News-Record*.



. . . Court flouted by Ickes' action in retracting canal piling award.

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. . . Seventy-fourth Congress dissolves after spending $20,000,000,000.

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. . . Government may invoke anti-trust law on alleged collusive bidding by steel companies.

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. . . John L. Lewis visits White House to approve Democratic plank on labor; Philadelphia convention can now proceed.

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BY L. W. MOFFETT

Resident Washington Editor, The Iron Age

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WASHINGTON, June 23—Rule by bureaucracy was given another remarkable demonstration when Secretary of the Interior, Harold L. Ickes, withheld from the Jones & Laughlin Steel Corp. a contract for 720 tons of sheet steel piling for the All-American Canal. Mr. Ickes said he took this action because the steel company had been found guilty by the National Labor Relations Board of unfair labor practices. Yet, on the day preceding announcement of the action, the Fifth Circuit Court of Appeals at New Orleans, by unanimous decision, held that the National Labor Relations act was unconstitutional. Having so held, the Court obviously declined to enforce an order of the NLRB requiring Jones & Laughlin to reemploy discharged men, members of the Amalgamated Association of Iron, Steel and Tin Workers.

Mr. Ickes did not say he withheld the contract because of the Court decision. Rather, he said the contract was about to be awarded to Jones & Laughlin when the NLRB informed him of its decision against the company. Negotiations in connection with award of the contract were stopped, it was stated. The board decision, however, had been made long before the Court action, and withholding of the contract came immediately after the decision. The timing was too nearly perfect to permit any conclusion other than that Mr. Ickes, petulant over the decision, struck back by withdrawing the proposed contract and then fell back for support on the order of the NLRB. In other words, an established Court, with authority to pass upon the validity of an act which the board was set up to administer, has at least indirectly been flouted, and the order of the board, which the Court declared to have no authority, has been recognized over that of the Court.

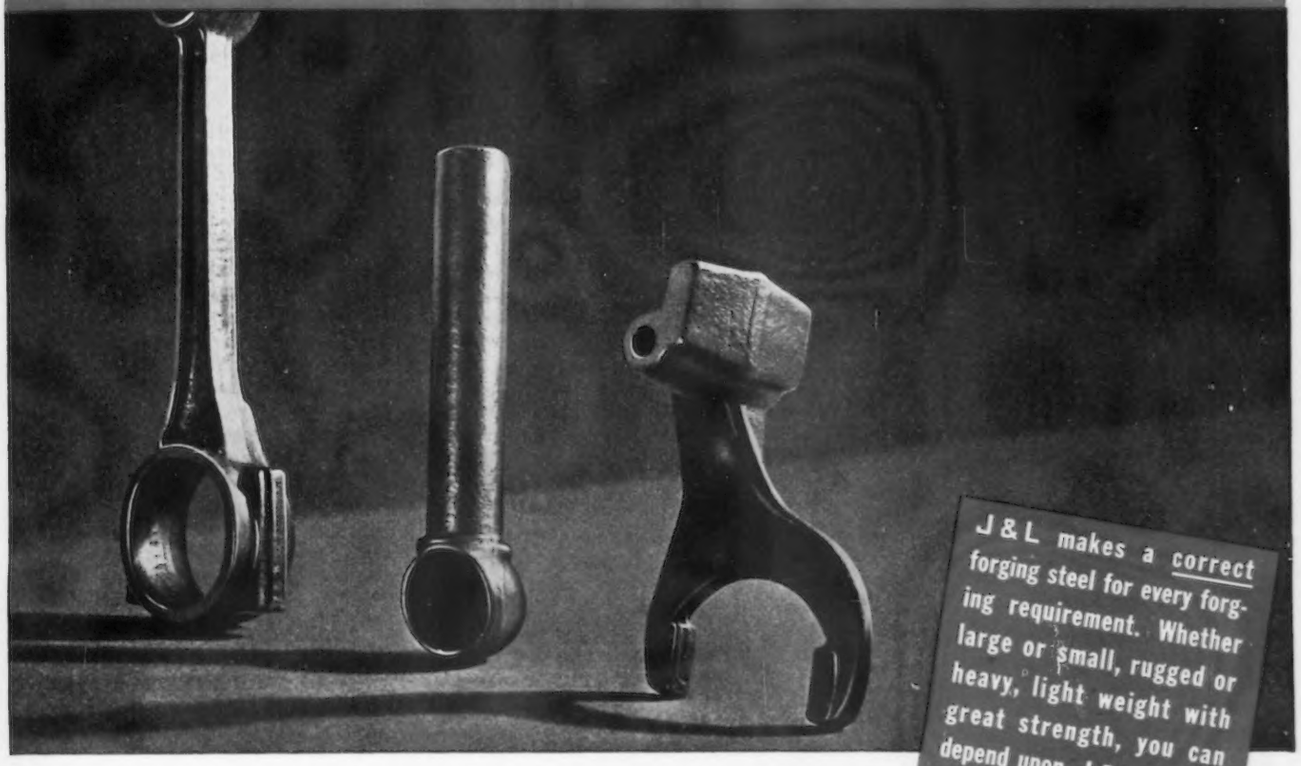
Just because the Court did not share the personal view of Mr. Ickes, the latter vented a petty emotion, and withdrew the contract. Legally, no doubt, Mr. Ickes had the right to withhold the contract. The award was offered to another bidder, but was declined because of an adjustment asked for by the PWA in the delivered price due to a reduced freight rate between Los Angeles and Portholes. The company concerned was agreeable to an allowance for the lower rate, but not on the basis desired by the PWA which was designed to affect the entire movement and sharply reduce the net mill price. The point is that Secretary Ickes took the action immediately on the heels of the Court decision, which certainly smacked of bureaucratic disdain of the Court. . . otherwise, why the delay? Why was not the action taken immediately after Mr. Ickes was informed by the NLRB of its order? This was not the policy pursued, rather the policy was one that has been characteristic of the New Deal administration, that of jibing at decisions when decisions have not met with its own pleasure. That such decisions have been terrifically numerous is a disconcerting commentary on the administration of government affairs.

Mr. Ickes' statement that "In the case of deciding between identical bids, I shall always prefer that of the bidder which is fair to workers" was far-fetched. The matter of wages, hours and working conditions had nothing to do with the bids.

In any case, the Secretary finally decided to cancel all the bids, and ordered the Bureau of Reclamation to readvertise for new ones . . . a move which appears to have significance. First, it seemed to be strangely timed to the report of the Federal Trade Commission which charged steel manufacturers

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with collusive bidding on sheet piling in connection with PWA contracts. This was the result of an investigation ordered by the President at the behest of Mr. Ickes. Could it be that the report is an intimation to steel manufacturers that they should not submit identical bids in response to the readvertised invitations of the Bureau of Reclamation, to be opened on June 30, a date, no doubt, which takes into consideration the fact that it is the final one on which second quarters quotations will be made inasmuch as announcement has been made of a $2 a ton rise in the third quarter? Secondly, it is strongly suspected that new bids have been called for as a means of carrying out the peculiar slant of Mr. Ickes, namely, to see that, in case of identical bids, the net to the mill is pared down to the lowest possible point. This means that in such a circumstance the mill farthest removed from the point of delivery is given the award. It was for this reason that Mr. Ickes, as he pointed out, was preparing to make the award to Jones & Laughlin for the All-American Canal job. He said that the Bethlehem Steel Co. was disqualified because of a discrepancy. It would appear, therefore, that, all things being equal, if Bethlehem should remove the "discrepancy" and submit a bid, it would get the award since its Buffalo plant is the farthest removed from the canal dam site.

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Congress Sets All-Time Record for Spending

If records alone, without regard to their character, are something to boast about, then the recent unlamented 74th Congress may well point with pride. That is, those of New Deal persuasion may do so. And they constituted the great majority both in the House and in the Senate. There are two outstanding things about which it may boast: A $20,000,000,000 Congress, setting an all-time peace record, either in spending taxpayers' money; and an unparalleled subservience, for, like a group of marionettes, it danced at the slightest tug of the Presidential string.

It came to a tired, dreary and wrangling end at 12:38 a. m., June 21, when the second and final session completed its hectic labors by plastering the statute books with a mass of legislation, some of it quite weird. It appropriated the cool total of $9,716,430,863. It was, or sought to be, a Congress for certain groups and against other groups, with its eye fixed at all times on political expediency. It is likely that many of those it affected to legislate for will not enjoy the legislative pills handed out to them, finding that they will do more harm than good. The big idea was to play to agriculture, labor and the little business man, and to oppose big business.

Standing out prominently in legislation enacted were the revolutionary tax act; the Walsh-Healey Government contract act; the $1,425,000,000 relief act; the $1,730,000,000 bonus act; a national defense appropriation of about $909,650,000; the rural electrification appropriation of $410,000,000; the $500,000,000 soil conservation act; the ship subsidy act; and the Patman-Robinson anti-price discrimination act. There were many other important acts passed.

There was proposed legislation that did not make the riffle. Included in this category was the Wheeler - Utterback anti - basing point bill, directed particularly at the steel and cement industries. It became evident after extensive hearings before the Senate Committee on Interstate Commerce, at which many prominent steel executives testified, that the majority members of the committee were against the bill. Therefore it was never reported to the Senate. A poll taken also indicated that a majority in the Senate opposed the bill. Nothing was done with respect to the bill on the House side where it was introduced by Representative Utterback of Iowa.

The Federal Trade Commission, however, in its acrid report regarding alleged collusive bidding on sheet piling for PWA-financed projects, has recommended anti-basing point legislation. The President has passed the recommendation along to the Attorney General, leaving the impression that legislation to this end may be drafted by the Department of Justice for the next session with Administration pressure back of it, if the New Deal is continued in power.

The new tax law is a wide departure from previous laws of the kind. The legislation, asked for by the President, was vehemently assailed by business and industry generally and while it is not so sweeping as it was when passed by the House, it was bitterly attacked in the Senate by a group of Senators, both Democrats and Republicans. James A. Emery, general counsel of the National Association of Manufacturers, branded the measure as an unprecedented example of recklessness, and as "a mixture of contradictory theories and ambiguous liabilities."

Crammed through a worn Senate, the bill was the final obstacle to adjournment. Mr. Emery, whose views are those of business and industry generally, said that it "converts the ascertainment of tax liability into a continuous conundrum, imperils the production of reliable revenue and threatens the safety of many struggling forms of business."

An even more bitter attack was made on it in the Senate by two prominent Democrats, Byrd of Virginia and Walsh of Massachusetts. Senator Byrd assailed it as a crushing force for the smaller businesses with no surpluses to the advantage of large corporations which have already built up surpluses.

The stated purpose of the act is to force dividends into circulation. Graduated taxes are imposed on corporate earnings ranging from 7 per cent on the first 10 per cent of profits withheld to 27 per cent on all earnings retained in excess of 60 per cent. This levy on undistributed profits is to be piled on top of normal corporate income taxes beginning at 8 per cent on the first $2,000 and running up to 15 per cent on all over $40,000. The act continues capital stock and excess profits taxes, the capital stock tax reduced from $1.40 to $1 per $1,000. Dividends in the hands of shareholders were made subject to a 4 per cent normal income tax and banks and insurance companies were made subject to a flat 15 per cent tax while personal and holding company taxes were reduced to 5 per cent. Intercorporate dividends will be made subject to a tax of 15 per cent instead of 10 per cent as at present. The proposed tax on palm oil, used for tin plate baths, was struck out.

The Walsh-Healey Government contracts bill was also jammed through the Senate after it substituted the House bill in the final rush. It was strongly opposed by industry and was sponsored by organized labor with Administration backing. Among objections made to it is that it will be most difficult, if not impossible, to adhere to in attempting to separate production as between government and private requirements. It requires all contractors selling $10,000 or more of materials to the Government to adopt an 8-hr. day, 40-hr. week, and to pay wages prevailing in the community.

The Patman-Robinson act is supposed to be aimed chiefly at chain stores but prohibits all price discrimination between buyers of similar quantities and qualities of goods. It also prohibits payments of rebates, allowances, etc., and

authorizes the Federal Trade Commission to fix the limit of discounts on quantity purchases where such purchasers are so few "as to render differentials . . . unjustly discriminatory or promotive of monopoly." Like the tax and other new legislation, the Patman-Robinson act is the object of conflicting and confusing interpretation.

Due to a night-long filibuster against it by youthful Senator Holt of West Virginia, assisted by a group of other Senators, the Guffey-Vinson coal bill failed of passage and its death was witnessed from the gallery by President John L. Lewis of the United Mine Workers who had demanded that it be passed. When before the Senate Committee on Interstate Commerce, he threatened a "shutdown" of the coal industry unless the right was given employers and employees to fix coal prices. In the course of his filibuster against the bill, Holt, looking up to Lewis, shouted that "John L. Lewis is not going to get this bill." Holt won his battle and forced leaders to capitulate in order to reach adjournment at the time set. This was the only so-called "must" bill of the New Deal that was not pushed through.

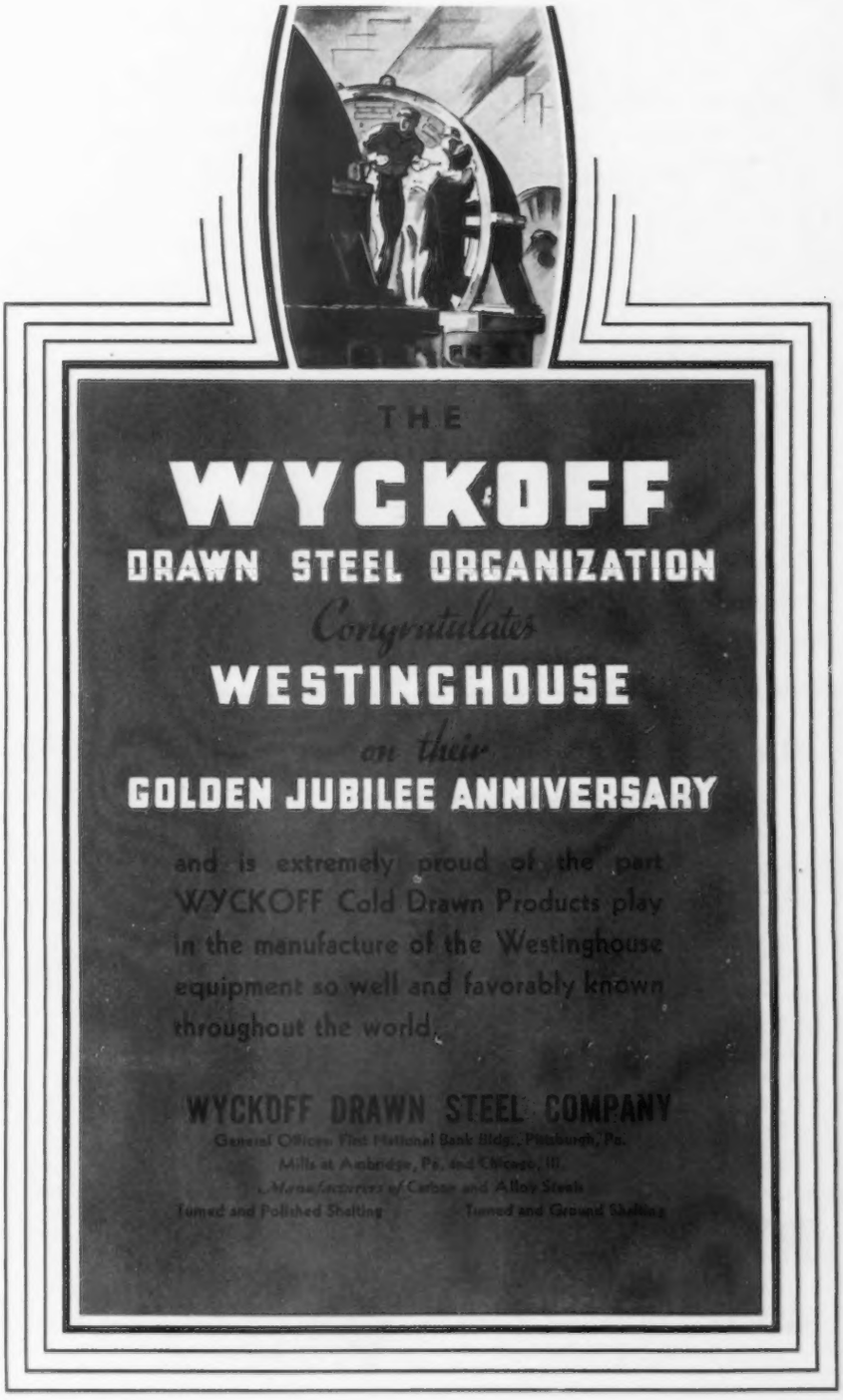
The so-called "deceptive practices" bill authorizing the Federal Trade Commission to go on snooping expeditions in search of such practices, died in the House Committee on Judiciary. The anti-lobbying bill, sponsored vigorously by Senator Black, after passing the Senate, was killed in the House. The reason for its death is simple. It was opposed by organized labor and farm organizations. The office of Federal Coordinator of Transportation was allowed to expire, though the Administration had made a feeble suggestion that it be continued. Continuance was strongly urged by Joseph B. Eastman, the able coordinator under whose direction a staff has done much research work looking to elimination of waste and improved efficiencies in transportation. The failure to continue the office was due to opposition from both railroad executives and railroad labor.

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Regulations For Export of Tin Plate Scrap

Acting under the new law governing shipments abroad of tin plate scrap, Secretary of State Cordell Hull, as chairman of the National Munitions Control Board, has issued regulations providing for licensing exportations of such scrap between July 1 and Dec. 1. Licenses will be based on allotments to producers. Producers, including those whose scrap is sold to and ultimately exported by third parties, are asked to inform the Department of State at once as to the quantity of tin plate scrap which they desire to export, or to sell for export for the six-month period.

Allotments will be assigned on July 1 and will be based on the quantity specified in the individual producer's request, with the reservation that if any request for allotment exceeds 50 per cent of the producer's production in 1935, the latter figure shall be used as the basis. Producers who lack definite information as to the ultimate destination of their scrap are requested to ascertain immediately whether the persons to whom they sell their product dispose of it in the domestic market or export it. Unless they are assigned allotments on July 1, it was pointed



out, the scrap may not be exported either by them or any other person during the period. Allotments will be granted to producers only, but licenses for the actual exportation may be issued to any person who makes application provided the scrap is a portion of an allotment previously assigned to a producer.

Additional allotments may be granted after July 1 to any tin plate scrap producer, regardless of whether he did or did not participate in the original assignment of allotments, who presents to the Board convincing evidence that he is not receiving fair consideration.

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Population Trends May Be Studied

The Business Advisory Council of the Department of Commerce, at a meeting on June 18, gave consideration to the recommendation of Daniel C. Roper, Secretary of Commerce, for a study of population trends. The Secretary pointed to the possible economic significance of figures revealed by a report of the Census Bureau showing a drift of almost 2,000,000 people from cities and towns to farms during the five-year period from 1931-35. The Council agreed to consider the possibility of bringing these figures up-to-date, as well as a continuous study of the problem for the determination of causes and effect. Secretary Roper said he believed a proper distribution of the population of the country is a major problem deserving careful consideration and approach.

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Farm Machinery Industry Upheld as Federal Price Investigation Nears

Commenting on the recently passed Congressional resolution requiring the Federal Trade Commission to investigate farm machinery prices, W. C. MacFarlane, president, Farm Equipment Institute and Minneapolis-Moline Power Implement Co., said that an impartial investigation will show that there is no monopoly or price fixing. It will show, he stated, that prices are reasonable, whether considered from the standpoint of pofits or when compared to the products of other industries using similar materials and having similar labor content. There are many misapprehensions concerning the farm equipment industry, Mr. MacFarlane said, which the investigation should be helpful in correcting.

"Only last August, the United States Bureau of Labor Statistics completed an investigation of wholesale farm machinery prices from 1913 to date which showed that the weighted average price of farm machinery was 97 per cent of the 1913 price, and this notwithstanding the doubled cost of labor and greatly increased cost of materials since 1913.

"These figures take no account," Mr. MacFarlane continued, "of the marked improvement in quality of farm equipment, as a result of which farmers receive a much greater value, dollar for dollar, through increased usefulness and greater durability. The industry has done an outstanding job in offsetting the higher cost of labor and materials with better manufacturing processes and, at the same time, in improving the machines. All of this is helping the farmers to reduce the costs of producing their crops.

"Corresponding to the 'big three' automobile companies, there are seven full line companies manufacturing practically all types of farm machinery and maintaining national sales organizations. There are also many companies with limited lines, or in localized territories. All of these companies, large and small, are actively competing for the farm trade.

"The American farm equipment industry has had no tariff protection since 1913. Notwithstanding this fact, it has maintained itself against competition of other industrialized countries paying extremely low wages."

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Practice Recommendation for Heating Boilers

The Division of Simplified Practice, National Bureau of Standards, has mailed copies of a proposed revision of Simplified Practice Recommendation R157, Steel Horizontal Firebox Heating Boilers, to all interests for consideration and approval. The original recommendation, which was to have become effective on July 1, 1935, was held in abeyance pending modifications and changes to insure more general adoption. The revised recommendation, which covers a simplified schedule of standard ratings and pipe connection openings, will be promulgated when an adequate volume of acceptance has been recorded.

▼ ▼ ▼

Chamber of Commerce Adopts Program

A program for the coming year, having for its purpose the formulation and effectuation of national policies which may contribute to economic recovery and increased employment, has been adopted by the board of directors of the Chamber of Commerce of the United States.

Subjects to which the Chamber

RUEMELIN COMPRESSED AIR DRYERS

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Highest Efficiency.

Costs nothing to operate.

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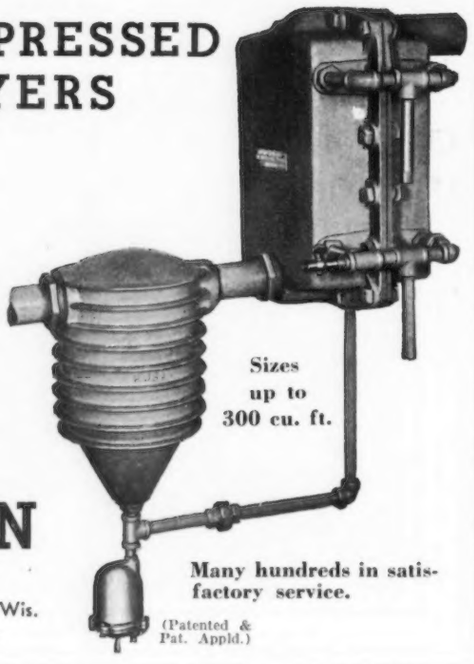
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will give major attention include reduction in public expenditures, government competition, social security, state compacts, employment, monetary policy, tariff treatment of agricultural products, prices in distribution, merchant marine legislation, and government reorganization. In addition to these questions, which have been chosen for special attention, the Chamber will deal with numerous other problems in the field of business enterprise.

▼ ▼ ▼

Lewis Approves Democratic Labor Plank

Demands which the Committee on Industrial Organization has in mind in connection with its effort to organize the steel industry may be reflected in the New Deal platform at Philadelphia. This is indicated by the fact that at a one-hour conference at the White House, Monday, President Roosevelt submitted the labor planks to John L. Lewis, chairman of the C. I. O., and Mr. Lewis said he was "eminently satisfied" with them. Apparently also Mr. Lewis was reconciled by the planks regarding a new Guffey coal bill whereas when he recently appeared before the Senate Committee on Interstate Commerce he threatened that he would "shutdown the industry" if the measure was not enacted into law.

"I discussed with the President the whole situation as it affects the coal industry appertaining, since the defeat of the Guffey bill in the Senate Saturday night and the general question of the attitude of labor toward platform declarations and possible future legislation," said Mr. Lewis, after stating that he and the United Mine Workers of America would support Roosevelt for reelection. "I can only say that I am entirely in accord with the things the President seems to have in mind and I am eminently satisfied with the policies he proposes to espouse. I shall support him for reelection to the fullest degree and the United Mine Workers as such will continue to use their influence and resources in support of the President in harmony with their February declaration."

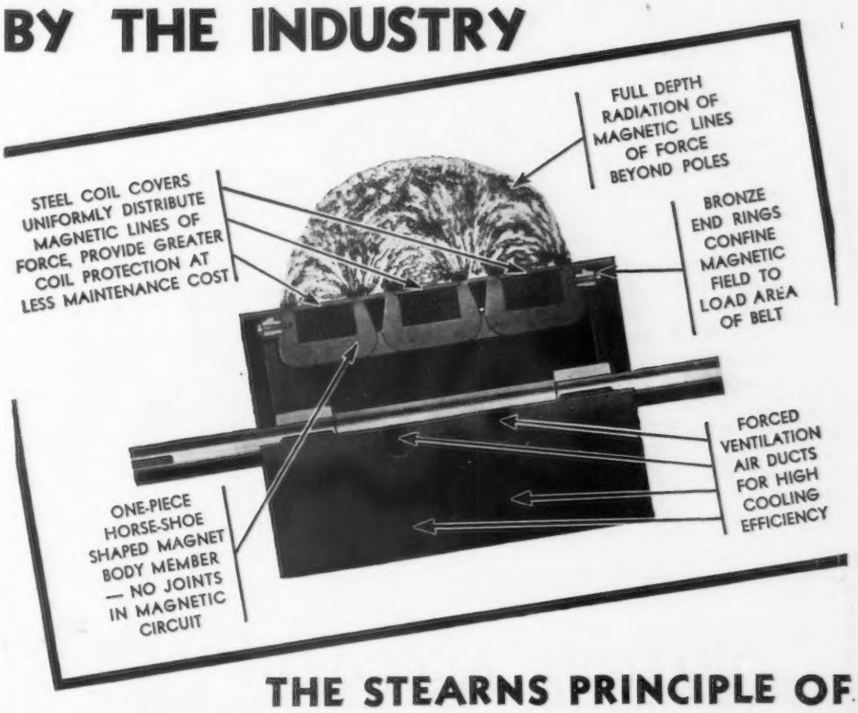
The February declaration has reference to a resolution unanimously adopted at the Washington convention of the United Mine Workers.

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Steel Works Employment Highest Since 1930

Employment at blast furnaces, steel works, rolling mills, foundries and machine shops reached the highest level in May since September, 1930, according to Secretary of Labor Frances Perkins. Her statement was based on the monthly survey of the Bureau of Labor Statistics, which showed a gain of all reporting manufacturing and non-manufacturing industries estimated at more than 80,000 workers. With the three-year average, 1923-1925, representing the index of 100, employment at blast furnaces, steel works and rolling mills was recorded at 82 compared with 79.7 in April while the index for iron and steel and their products as a whole rose to 81 from 79.1. Employment in the foundry industry rose to 86.1 from 83.8, while employment in the machine tool industry was 107.8 against 105.9.

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Federal Trade Commission Reports to President on Alleged Collusive Bids

WASHINGTON, June 23.—Holding that collusive bidding has occurred on steel sheet piling for three projects financed by the Public Works Administration, the Federal Trade Commission in a report to President Roosevelt said that it found there was "reasonable ground to believe that the anti-trust laws have been violated." As recommended by the commission, the President referred the report to Attorney General Homer S. Cummings "for appropriate action." The conclusion drawn is that the Department of Justice will make an investigation as to whether or not it should institute anti-trust proceedings. The President, however, did not directly ask that such action be taken, but his letter to the Attorney General which accompanied the report left the action to the discretion of the Department of Justice.

Other specific recommendations made by the commission and directed to the attention of the Attorney General in the President's letter led to the belief that if continued in office, the Roosevelt Administration will definitely urge legislation at the next session of Congress to abolish the multiple-basing point system in the steel and other industries. Whether this means direct Administration support of the Wheeler-Utterback bill is not known, but the supposition is that it does.

This bill, left in the Senate Committee on Interstate Commerce without action following prolonged hearings, has the support of the Federal Trade Commission. The commission recommendation asked for legislation "to make existing unfair practices unlawful." That the legislation would be in the nature of the Wheeler-Utterback bill, requiring f.o.b. mill quotations rather than delivered price quotations, is indicated by the attack the commission makes, as it has occasionally made in the past, on the basing point system as lending itself to so-called collusive bidding, and elimination of price competition.

Included in the President's letter also is a commission recommendation that the President request Federal Government purchasing agents to collect evidence "regarding instances where there has been collusive or identical bidding." The assumption from this request is that the evidence, to be furnished to the President, will be turned over by the latter to the Department of Justice.

After directing the Attorney General's attention to commission recommendations, the President on his own initiative asked the Attorney General to prepare the necessary letter to purchasing agents, to be sent out by the President at once, and also to prepare a draft of recommendations to the Congress at its next session.

German "Dumping" Not Seriously Considered

Tied into the inquiry regarding alleged collusive bidding on sheet piling was an inquiry as to whether German sheet piling, intended for one of the PWA-financed projects involved in the case, had been dumped into the United States. In striking contrast to the vigorous indictment the commission levels against domestic manufacturers of sheet piling, it dismisses the German situation briefly with the statement that it was unable to obtain the necessary data, either through American consular officials or from American piling producers, to permit a definite answer to the question. This is taken to mean that, whereas proceedings may be instituted against domestic makers, nothing will be done with regard to alleged dumping of German sheet piling.

The report was the outgrowth of a complaint by Secretary of the Interior Harold L. Ickes as Public Works Administrator, of identical bidding during August and September, 1935, on the Triborough bridge in New York, the Deep Sea Harbor project at Miami, Fla., and an ocean terminal at Morehead City, N. C. Mr. Ickes carried the complaint to the White House and the President ordered the commission to make an investigation. Award for German sheet piling had been made for the Triborough job, but was canceled after a row raised by Mayor LaGuardia and others. The Moorhead City job has 1100 tons of piling and 200 tons of accessories, all of which is German material.

Acting Under Code Rules

The report said that the commission found that the production of steel sheet piling "is concentrated in the hands of four concerns, the United States Steel Corp., the Bethlehem Steel Co., the Jones & Laughlin Steel Corp., and the Inland Steel Co.," all of which were bidders on the stated projects. It was stated "that these companies admitted that they quoted identical delivered prices because they were acting pursuant to a resolution of the industry continuing in effect the provisions of its former code with regard to the basing point system of delivered prices and related practices."

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The report said that the "admissions" were confirmed by breaking down the identical delivered prices into their constituent elements and then accounting for the identical character of each element. These elements, such as the mill price, freight, charges for "extras," and accessories, and discounts for early payment are set forth. It was declared that "the methods of calculating each element were found to have been expressly authorized either by the code or by resolutions and interpretations of the American Iron and Steel Institute." Further it was stated that "these methods were either continued in force or established anew, after the code, as such, had passed out of existence." Yet the commission said it was unable to determine whether the prices were "fair and reasonable."

Contention was made that the report demonstrated that the basing point system on steel sheet piling is in essence a single basing point system over large areas, with Pittsburgh governing most of the eastern section of the country, and Chicago governing most of the West. The report did not mention the fact that Los Angeles is also a basing point for sheet piling.

Does Not Know Whether Prices Are Fair

The report saying identity of delivered prices of steel products generally is preserved to the fraction of a tenth of a cent by elaborate formulae worked out by committees of the Institute, cites a $60,000 government order for pipe, where a bidder was 12c. below his competitors because he carried out the delivered price to three decimal places instead of two and added that, when discovered, "such loopholes were stopped by special provisions."

Reasons which the commission said preclude any affirmation of the fairness and reasonableness of the prices on sheet piling were stated as follows:

"The tendency of any price-fixing combination is to foster inefficiency and to prevent the low-cost producer from passing on to the consumer the benefit of his efficiency in the form of lower prices.

"The reasonableness of prices depends in part on whether they are supported by a policy of restricted production that increases unit costs of production.

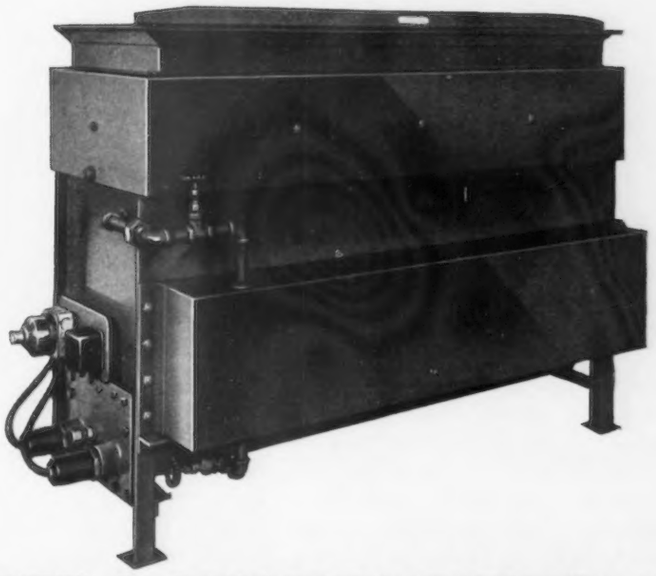
"No progress can be made toward determining the reasonableness of piling prices without knowledge of the cost of producing piling, and this the piling producers refused to disclose.

"When pressed, the piling producers offered to accept a reduction of nearly 25 per cent in their mill net prices, but steadfastly refused to make any reduction in their delivered prices.

"There is no feasible way of determining whether a given price on only one of a large number and variety of steel products is fair and reasonable without reference to the prices of such other products and the price structure which supports it.

"As a matter of public policy, it cannot be admitted that prices collusively determined in violation of law might conceivably be fair and reasonable."

That the report will play a part in the so-called anti-monopoly planks of the Democratic convention at Philadelphia was indicated by a report from that city. The attention of Attorney General Cummings, chairman of the Connecticut Democratic state delegation, was directed to the commission recommendation for legislation to make "existing unfair practices unlawful." When asked if the suggestion might be included in that platform, the Attorney General is reported to have replied that the "substance of that matter might very well be considered by the resolutions committee."



WHY A MANUFACTURER OF METAL OFFICE EQUIPMENT USES DETREX DEGREASING

A large manufacturer of metal office equipment gives the following reasons for operating a DETREX VH 400 Degreasing Machine on his production:

1—No fire hazard—Perm-A-Clor is non-inflammable
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4—Cleaning costs reduced over previous method
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C. R. Burt Heads Niles-Bement-Pond



CLAYTON R. BURT, heretofore president of the Pratt & Whitney Co., Hartford, has been made president of the Niles-Bement-Pond Co., which has taken over the assets of the Pratt & Whitney Co. Mr. Burt went to Hartford as general manager of the Pratt company in 1924. He has had a wide and varied experience in manufacturing lines. He received his early training at the plant of the Brown & Sharpe Mfg. Co., Providence, where he held several responsible positions. Later he became connected with the Barber-Coleman Co., Rockford, Ill. During the War he was responsible for equipping and operating four large manufacturing plants at Toronto and two plants in Buffalo, for the production of shells, fuses and gun mounts. In recognition of the fine record made in these shops, Mr. Burt received special mention from the British Government and from the Navy Department in Washington.

After the War, Mr. Burt became connected with the Willys Corp. as president of the New Process Gear Co. He resigned that post to become president of the Austin Machinery Co. before becoming identified with the Hartford company. Mr. Burt is first vice-president of the National Machine Tool Builders Asssociation. He will make his headquarters in Hartford, where the general offices of the Niles-Bement-Pond Co. will be located.

NEWS AND MARKET INDEX

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PUT YOURS TO WORK *Profitably* - TOO!

FAMOUS makers of Acme Steelstrap and Superstrip *had* to make existing warehouse space hold more stock—at the same time, they desired to reduce costs of transporting product between coilers and freight cars. Originally they handled coils separately, picking up and laying them down *four times.*

Working together, Acme Steel Company and Elwell-Parker Engineers developed *ideas* into *plans* for loading coils on light, inexpensive wooden pallets and conveying these on Elwell-Parker Power Industrial Trucks from coiler to warehouse to boxcar. Load per trip has snapped up from one coil to 30; pallet-loads as heavy as 4,000 pounds are taken as a matter of course; and the pallet instead of individual coils is now the load unit. Coils are shipped on pallets to destination.

From four separate handlings, the coils are now touched *only once*—when first stacked on pallets at coiler. The Elwell-Parker System provides much greater speed, and complete flexibility: trucks enter boxcar under load, spot each pallet precisely in place, then scoot back to warehouse for the next load.

Are *you* shouldering needless losses and doing nothing to stop them?

Why not follow Acme's lead and invite Elwell-Parker Engineers to join with your own in a careful analysis of your present materials handling methods? The Elwell-Parker Electric Company, 4225 St. Clair Ave., Cleveland, Ohio.

New ELWELL·PARKER *Trucks*

ESTABLISHED 1893 • BUILDING POWER INDUSTRIAL TRUCKS SINCE 1906

Plans Formulated for Steel Organizing

PITTSBURGH, June 23. — Following the meeting of the Committee for Industrial Organization held in Pittsburgh, definite plans for organizing the steel workers were decided upon. Initiation fees for the new members joining the Amalgamated Association of Iron, Steel and Tin Workers have been waived, and dues will be $1 per month.

According to the spokesman, strikes will be used only as a last resort in the move to bring steel workers into the union. One important policy is that complete control of all organizing activities will be in the hands of the committee's executive officers, headed by Philip Murray, international vice-president, United Mine Workers of America. The leaders insist that this policy will be strictly adhered to in order to mitigate any chance of "outlaw" sporadic outbursts.

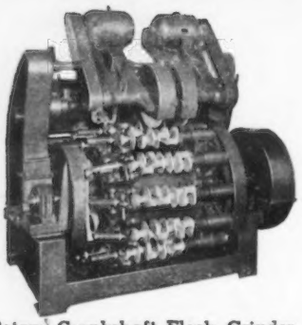
Several mass meetings will be held in this district in the future, and speakers have been lined up for the occasion. According to the committee, 14 organizers have moved into the Pittsburgh and Chicago steel districts, and the announcement has been made that 100 additional men will be assigned as local representatives within 10 days, to be augmented later by those provided by the 10 unions affiliated with the CIO.

The following field representatives in the Pittsburgh district were announced: Baltimore and Sparrows Point, Robert B. Kimbell, a member of Maryland's State Senate; Youngstown and Mahoning Valley, Frank Shiffka, Harry Tetlow, William Evans and Joseph K. Gaither of the Amalgamated; Aliquippa, Joseph Timko; Johnstown, Thomas Butler; Bethlehem and surrounding vicinity, Garfield Lewis; Weirton, George Lambert; Pittsburgh, Anthony Fedderoff and J. B. Busarelo.

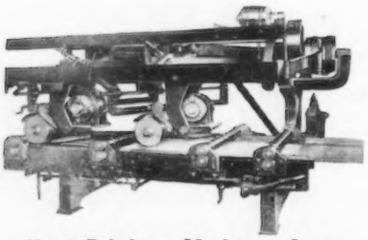
William Sneed, Nicholas Fortechio and B. J. Danich, international representatives of the United Mine Workers, will begin the organization work in the Chicago district.

It is reported that the committee is considering the use of radio, the establishment of a newspaper and formation of a group of "stump speakers."

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Rotary Crankshaft Flash Grinder—A 6-wheel unit, grinds all flashes from eight automobile crankshafts per minute.



Sheet Polishing Machine — A continuous feed unit operating at various speeds depending on the finish desired.



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Labor saving machinery for polishing, buffing and grinding is ideally adapted to those plants having sufficiently large production requirements or a difficult finishing problem to justify its installation. . . . With this type of equipment—*Production* flows smoothly and evenly as the machinery operates at a predetermined speed to handle a definite production per unit time. . . . *Uniform finish* is ensured as each piece receives exactly the same treatment as the preceding piece thereby lowering the percentage of rejects considerably. . . . *Large Savings* are effected in labor and floor space. . . . Automatic machinery for polishing, buffing and grinding may be designed to handle practically any type of product. Udylite engineers are at your disposal for consultation.

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Employees Vote Heavy At Carnegie Elections

HEAVY voting featured the general election of employee representatives at the various plants of the Carnegie-Illinois Steel Corp. Many representatives were reelected and in many cases new men have been chosen to represent their fellow workmen. The percentages of eligible employees voting at the various plants were as follows: New Castle, Pa., works 97.99 per cent; Sharon, Pa., works 95.12 per cent; Guernsey works, Cambridge, Ohio, 97.08 per cent; Farrell, Pa., works 93.23 per cent; Laughlin works, Martins Ferry, Ohio, 98.2 per cent; National works, Monessen, Pa., 93 per cent; Vandergrift, Pa., works 85.06 per cent; Wood works, McKeesport, Pa., 100 per cent; roll and machine works, Canton, Ohio, 97.59 per cent. The majority of the above plants are those formerly

associated with the American Sheet & Tin Plate Co.

Other plants follow: Lorain works, Johnstown, Pa., 91 per cent; Gary sheet mill, 81.5 per cent; Gary tin mill, 99.5 per cent; Clairton, Pa., works, 83 per cent; Dusquesne, Pa., 94.02 per cent; Edgar Thomson works, Braddock, Pa., 81.7 per cent; Farrell, Pa., and Central furnaces, Cleveland, 90.1 per cent; Homestead, Pa., works, 85.9 per cent; Isabella and Lucy Furnaces, Pittsburgh, 99 per cent; Mingo works, Mingo Junction, Ohio, 95 per cent; River Transportation, Clairton, Pa., 83.29 per cent; Youngstown district plants, 88.68 per cent, and Texas warehouse, Houston, Tex., 91 per cent.

Vulcan to Use New Ingot Mold Process

VULCAN MOLD & IRON CO., Latrobe, Pa., following considerable experimentation and tests, is in process of changing over plant equipment to manufacture its ingot molds by an improved process new to the foundry industry. The company has secured the United States license to make ingot molds by the cement-bonded sand process known as the "Randupson" Process. It is covered by the Durand patents, which are held by the French Societe D'Electro-Chimie D'Electro-Metallurgie et des Acieries Electriques D'Ugine.

Developed specially to remove factors productive of surface defects in the casting, and to promote greater accuracy in size and contour, the Randupson process is represented by the Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa., as United States agency for the French company. For some time Birdsboro has used the process in its own plant. The use of the cement-bonded sand process by Vulcan is entailing a complete change-over of its plant facilities, which is being pushed to completion as rapidly as possible. The company expects to be manufacturing its entire output by the new process by mid-July.

Approximately 500 members of the Foremen's Club of Dayton, Ohio, were entertained by the Cincinnati Milling Machine Co., Cincinnati, on June 20. The visitors inspected the milling, the grinder and the foundry units of the company during the morning and were guests of the management at luncheon.

Salute to WESTINGHOUSE!

For their fine record of progress as portrayed in this issue of Iron Age and for their many contributions to Industry in America.

From time to time it has been our privilege as foundry specialists to supply various plants of this electrical giant with our—

Juniata Bank Sand
Refracto Fire Clay
Columbia and Diamond Sand Blast Sands
Stoody Borium Nozzles
Banding and Processed Silica Sands
A.B.C. Coke

In this issue, which is so largely devoted to Westinghouse, we think it right and proper to express our appreciation of their confidence and assure them that it is our ambition to maintain standards of quality and an Engineering Service that adequately measures up to their own.

GREAT LAKES FOUNDRY SAND CO.
United Artists Building **Detroit, Michigan**

Joliet Wire Rod Mill Under Construction

ERECTION of the structural steel buildings for the new rod mill of the American Steel & Wire Co. at Joliet, Ill., has been started and the placing of contracts, with the exception of a few minor items, for various mill equipment was finished in the past week. The plant will have two continuous rod mills, each consisting of 19 mill stands designed primarily for producing No. 5 wire rods. The rods will be rolled from 2⅜-in. square billets. The plant will have an annual capacity of 225,000 tons of wire rods.

The buildings, two in number,



The "RIVITOR"

Feeds and Sets SOLID Rivets Automatically

THE WORK is placed over the locator in the anvil. The rivet is fed automatically into the jaws which are carried down by the ram. The head is formed underneath the work. A gain in strength from 10% to 19% is accomplished (over that of other type rivet joints.)

May we send you literature describing further the many advantages of this machine?

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More Forgings

—from each sinking . . . more sinkings per die . . . *when you use*

MO-LYB-DIE BLOCKS

» Grade "FX" «

That is why
MOST DROP FORGERS
prefer them!

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» » Chicago, Ill. « «

side by side, will be 408 ft. long with a total width of 140 ft. They are to be erected by the American Bridge Co. The Lundoff-Bicknell Co. has the contract for the foundations. The mill stands have been designed by the company's engineering department. The housings will be supplied by the Birdsboro Foundry & Machine Co. Most of the electrical ejuipment will be furnished by the General Electric Co. and the Westinghouse Electric & Mfg. Co. The Lewis Foundry & Machine Co. will furnish the mill drives; the Gleason Works the spiral bevel gears for the drives, and the Kilby Mfg. Co. the reels. Pumps will be furnished by the Wilson-Snyder Co.

The mills will be fully equipped with anti-friction bearings of various types. Two Rust billet heating furnaces will be installed. The mill cranes will be supplied by the Alliance Machine Co., the billet yard cranes by the Harnischfeger Corp., and the rod-handling cranes by the Lakeside Bridge & Iron Co.

CLEAN RELEASE . . .



A Non-scattered, Clean Release of Brake Shoes from this EC&M Type SA Magnet is afforded by this Greatly Improved Controller.

CUTS DOWN THE TIME WAITING FOR MAGNET TO RELEASE THE LOAD

No delays . . . no scattered loads. The EC&M Automatic-Discharge Magnet Controller gives a clean, quick release of the load automatically. A compact, convenient Master Switch for the crane operator has but two positions, "Lift" and "Drop".

Allows the operator to make more trips. Faster action means better profits. Available for use with all sizes and types of Lifting Magnets. Ask for Literature describing and illustrating this improved Magnet Controller.

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BRAKES • LIMIT STOPS *and* LIFTING MAGNETS.

Owens-Illinois Glass Buys St. Louis Can

OWENS-ILLINOIS GLASS CO. has purchased for $278,500 all of the assets of the old St. Louis Can Co., 804 South Fourteenth Street, St. Louis. Sale included machinery, materials, accounts and good will from the General American Life Insurance Co., which had bought them from the receiver of the can company for $170,000 at auction.

The factory has been leased, and general line metal containers, including cans for oil, grease, paint and other plain and lithographed specialties, will be made there. About 200 employees of the factory have been retained.

Carnegie-Illinois Steel Orders Pressuremeters

CARNEGIE-ILLINOIS STEEL CORP. has ordered from United Engineering & Foundry Co. a complete installation of United's pressure meters for the new continuous 100-in. plate mill now being built by United Engineering for the Homestead, Pa., works of the Carnegie company.

These instruments, which represent a late development in steel-rolling practice, indicate rolling loads on each housing of all the major mill stands in the train. They give the operators a continuous indication and record of the rolling pressures, which permit them to roll most economically the material under accurately controlled conditions by balancing the rolling loads and reductions. The pressure meters have been installed by numerous other steel companies since their development in the past few months.

OBITUARY

MARSHALL R. SCOTT, president of Barlow & Seelig, Inc., Ripon, Wis., pioneer manufacturer of washing machines and other household appliances, died on June 11 of a heart attack. He was 45 years of age and a native of Wisconsin. Mr. Scott was a graduate of the University of Wisconsin and joined the firm as plant manager in 1927.

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AUGUST W. KRAUSE, president and treasurer of the Western Hardware Mfg. Co., Milwaukee, maker of hand and power tool grinders, died June 9, aged 70 years. He became an executive of the firm in 1914.

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WILLIAM B. CULLEN, owner and president of the Miami Foundry Co., Miamisburg, Ohio, died last week after a brief illness. He was the son of James Cullen, former president of the Niles Tool Works, Hamilton, Ohio.

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GEORGE HOAG, former vice-president of the Continental Bridge Co., Chicago, died June 12, aged 60 years. He helped organize the Bridge company 30 years ago and had been active in its management until about a week before his death.

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MILLARD J. ROBERTS, vice-president and general manager of the Silent Automatic division of the Timken-Detroit Axle Co., Detroit, died on June 18, of injuries received a few days before when his automobile overturned near Windsor, Ont. He was 39 years old. Mr. Roberts came to Detroit from Buffalo in 1934. He was formerly connected with the American Radiator Co. in Buffalo and was president of the Roberts Gas Burner Co. in that city.

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JOHN C. JUNKIN, president of the Junkin Safety Appliance Co., Inc., Louisville, Ky., died at Hamilton, Canada, while on a business trip on June 3, aged 69 years.

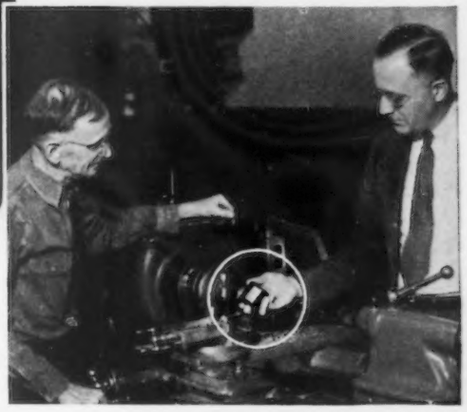
WHAT COULD THIS LITTLE BROWN BOX TELL YOU ABOUT YOUR LIGHTING?



This little brown box — the new G. E. Light Meter—might show you that the lighting you have been using in your office for close-seeing tasks is five foot-candles or less. This is far too dim for easy, safe seeing which requires between 20 and 30 foot-candles of light.



If fine precision work is done in your shop or factory, your employees could do better, more efficient work under 50 foot-candles of light than under the 10 or 15 so commonly used. For the Science of Seeing has shown that prolonged visual work in poor, inadequate light increases nervous tension . . . wastes energy.



DON'T GUESS about lighting. With a new compact G. E. Light Meter you can measure lighting as easily and accurately as a thermometer measures temperature. The Light Meter shows how much light is being received and indicates the minimum required foot-candles for different seeing tasks. Every employer and office manager should have one to make sure that employees are getting the light they need and to tell from time to time whether this amount of light is being maintained. The Light Meter is small, convenient. Ruggedly made, resembling a small thin desk clock, it costs only $11.50. For further information, write to General Electric Company, Department 166, Nela Park, Cleveland, Ohio.



EDISON MAZDA LAMPS
GENERAL ELECTRIC
They stay brighter longer ⟶

Malleable Founders Society to Broaden Scope; Professor Touceda Is Consultant

STEPS to broaden the activities of the Malleable Founders Society were taken at the annual meeting held at the Homestead Hotel, Hot Springs, Va., June 18 and 19.

The society engaged Prof. Enrique Touceda as its consulting engineer. Professor Touceda has long been associated with the industry as consulting engineer for the Malleable Iron Research Institute. His work with the society will be confined largely to product improvement and standardization and to market promotion by the development of new uses for malleable castings rather than to technical activities.

E. Clay Howell, who has been associated with the society for some time, was appointed shop practice engineer for field work. The members of the society have been divided into six groups and shop practice meetings of each group will be held to discuss ways of improving plant practice. Considerable good is expected to be accomplished through these cooperative efforts. During the first series of group meetings special attention will be given to two subjects: the causes of and remedies for cracked castings and procedures in determining piece rates. The group meetings will be attended by both Prof. Touceda and Mr. Howell.

Much interest was aroused in a report made by R. E. Belt, secretary, containing statistical data that he had prepared from a study of labor statistics including a study of the spread of rates of pay and hours of labor in 1933 to 1936 with effect on costs. This survey included the year before the code, the code period and the year following the code.

His investigation, based on figures obtained from plants of representative producers of malleable castings engaged in competitive work, showed that a great deal has been accomplished in stabilizing labor costs during the past three years. The difference in production costs due to the difference in rates of pay today are only one-fourth of what they were in 1933. While wage rates later were established under the malleable iron code, members do not give the code all th credit for improvement in wage conditions that has been attained by the industry. Mr. Belt's figures indicated that the sharp reduction in difference in costs due to the difference in rates of pay was true of all sections, except in New England, being less pronounced in that district because there evidently was less slashing of wage rates in New England than in other districts during the depression year of 1933.

The committee on wage and labor standards was instructed to study employment conditions in the plant of each member. This survey probably will cover such matters as hiring policies, age limits, health and sanitation, and vacations with pay, rather than the subject of wages and hours.

The proceedings included the annual report of Brinton Welser, president, vice-president of Chain Belt Co., Milwaukee; and of various committees. The afternoons were devoted to recreation and sports and an informal dinner followed the first day's session at which Prof. H. H. Maynard of Ohio State University was the speaker, taking for his subject "Can American Business Govern Itself?"

The election of officers was deferred to a future meeting of the board of directors. The personnel of this board, chosen in May, was announced. It consists of four directors from each of the three sections.



A Definition For Cast Iron

AS a result of discussion at the recent meeting of the metallurgical advisory committee to the National Bureau of Standards, Department of Commerce, the following tentative definition of cast iron, modified in accordance with the suggestions of the committee, is being considered by the Bureau.

"Cast iron is a cast alloy of iron and carbon, with or without other elements, in which the carbon content exceeds the maximum limit of solid solubility, as determined at any temperature (which in plain cast iron is 1.7 per cent) and, hence, contains eutectic carbide or graphite as a structural feature. It is not usefully forgeable at any temperature."

In commenting on this definition, H. S. Rawdon, chief of the metallurgical division, stated that many definitions of materials are more or less of the "text-book" variety and often are not suited to serve practically as a basis for differentiation of examples in case of dispute. Especially is this true when there is no pronounced line of demarcation, as in the case of cast iron and steel.

A criterion which would be useful in any legal action such as might arise in the delivery of a doubtful material is often very desirable, he stated.

• ***Capacity.*** The NATCO model D16H Vertical Hydraulic Feed Driller shown at the right is built for a variety of heavy duty drilling operations. It has a rated capacity of 20 one-inch drills in cast iron . . . or an equal capacity in a larger number of smaller drills. A similar machine may also be furnished with a rated capacity of 24 one-inch drills in cast iron.

• ***Hydraulic Feed . . . Simplified Control.*** This machine is arranged with a semi-automatic hydraulic feed. A single push button station permits instant and positive control of the head under all conditions.

• ***Adjustable Feeding Rate and Feed Lengths.*** The feeding rate is easily adjusted as required by means of a valve on the hydraulic pump assembly. The length of rapid traverse and feed strokes are adjusted by valve trip dogs which are located on the right hand side of the head.

• ***Variety of Heads and Spindle Speeds.*** This NATCO may be arranged with a flat slide for the mounting of a fixed center gear driven spindle box, or it may be arranged with two different sized adjustable multiple spindle heads equipped with either 16, 24 or 34 spindles. Anti-friction bearings are provided throughout all heads and a variety of spindle speeds may be provided.

• ***Sturdy Base with a Large Working Area.*** This driller is provided with a heavy cast iron base which is ribbed both lengthwise and crosswise for greater rigidity. The working surface is extremely large and is provided with 5 tee slots for clamping tables or work holding fixtures.

Yes . . . this machine is a heavy duty driller . . . designed especially for production drilling of large holes.



A Heavy Duty NATCO

for the Multiple Drilling of Large Holes

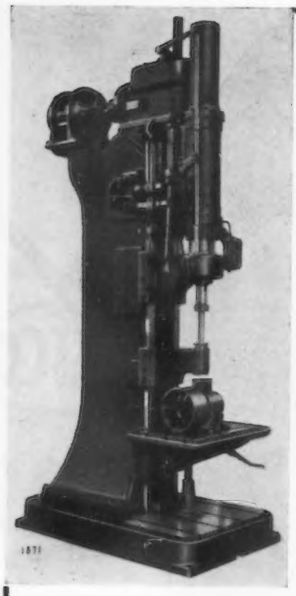
Install One Today and Cut Drilling Costs

• **The machine shown may not fit in your shop . . . yet among the many types and sizes there is one that will fit your particular needs. Let NATCO Engineers aid you in coming to a practical and profitable solution of your "hole problems". They are ready and willing to make a complete survey of your drilling, boring and tapping operations without any sort of an obligation on your part. Call a NATCO representative . . . do it today.**

• **Chicago Office: 2009 Engineering Building, 205 West Wacker Drive. Detroit Office: 409 New Center Building. Factory and Home Office: The National Automatic Tool Company, Richmond, Indiana, U. S. A.**

NATCO
SOLVES YOUR HOLE PROBLEM

NATCO Drilling, Boring, and Tapping Equipment



At Westinghouse

Hail Westinghouse on its Golden Jubilee! Fine products, organization, and equipment result in fifty years of successful leadership.

Illustrated is a H-2 Hydram Drilling Machine, part of the equipment we have sold to Westinghouse during many pleasant years of business relations. This Hydram has two quick changes of spindle speed, boring bar guide bracket, and automatic cycle of rapid approach, feed, and quick return. It is used for fine-boring cylinders in refrigerator compressors. Sample work-piece shown on table. (Fixture supplied by Westinghouse.)

Self-Oiling, All-Geared Drilling Machines and Hydrams are used in manufacturing all kinds of electrical apparatus and other products requiring drilling, boring, tapping, and kindred operations from 1/2" to 4" diameter. Our smaller Internal Honers are used extensively for giving refrigerator cylinders and similar parts a mirror-like *cut* finish, accurate within .0003", on a high production basis. Our larger Vertical and Horizontal Honers perform similar operations on a wide variety of products including Diesel engine cylinders, ordnance tubes and the like. Investigate. *Write today for Catalog I*

Barnes Drill Co., 815 Chestnut St., Rockford, Illinois, U. S. A.

Assistant District Sales Managers for Carnegie

CARNEGIE-ILLINOIS STEEL CORP. has announced appointments of assistant managers of sales at the following district offices: R. J. Stakelum at Birmingham; Russell W. Baker, Boston; William Gregor Crook at Hartford sub-office; W. P. Andrews and Albert P. Selby at Chicago; Wilber G. Somes at Cincinnati; William S. Saylor at Cleveland-Buffalo sub-office; H. B. Maguire and Howard V. Clark at Detroit; F. C. Buck and G. J. Stewart at Houston, Tex.; Arthur Bronson at Milwaukee; Richard Wayland-Smith and Walter C. Carroll at New York; Harry E. Duff and S. J. Cotsworth at Philadelphia; Harry C. O'Brien, George A. Higgins and Joseph G. Armstrong, Jr., at Pittsburgh; Peter D. Woods at Bluefield, W. Va., sub-office; O. J. Willis at St. Louis; Jerome F. McGee at Kansas City sub-office, and Andrew J. Snow at Washington.

IF YOU HAD POURED AS MANY MOULDS AS I HAVE, YOU WOULD KNOW THAT GOOD EQUIPMENT IS ESSENTIAL FOR THE PRODUCTION OF GOOD CASTINGS. I ALWAYS INSIST ON AMERICAN FLASKS AND JACKETS.



THIS MOLDER KNOWS!

For a few dollars you can modernize your small equipment and materially increase production. Let us make a recommendation on flask and jacket requirements, such as:

Featherweight Dow Metal Flask
American Heavy Duty Flask
Steel Plate Pouring Jackets
Flexible Aluminum Pouring Jackets
Flexible Cast Iron Pouring Jackets

Send for literature now

THE AMERICAN FOUNDRY EQUIPMENT CO.
401 Byrkit St., MISHAWAKA, IND.

FLASKS & JACKETS

Protests Additions to Costs of Railroads

STRIKING out boldly against brain trusters, who, he said, never had to meet a payroll on Saturday night, M. J. Gormley, executive assistant of the Association of American Railroads, Washington, gave the keynote address at the thirty-second regular meeting of the Allegheny Regional Advisory Board at Pittsburgh last week.

The railroads' greatest concern today, according to Mr. Gormley, is whether legislative bodies, as well as regular bodies, will protect the future of railroad transportation by doing nothing to add unnecessarily to the cost of railroad operation. He further added that "you sometimes hear that rugged individualism is ruining the country. That comes from the brain trusters who never had to meet a payroll on Saturday night." Mr. Gormley said the traffic of the railroad carriers is increasing and is now at a higher level than it has been in five years. According to him, all the railroads need is fair and equal opportunity in competition with their competitors and no interference with their progress from governmental authorities.

Proof that the speaker is and has been optimistic toward the future of the railroads is expressed when he said that "the railroads are not so much concerned today with their future ability to make the necessary reduction in operating costs in order that their transportation costs may be brought down to a point where no other means of transportation can compete with them for traffic that economically belongs on the rails. They are headed in that direction and in my humble opinion that goal will be reached."

Other speakers at the meeting were: John B. Keeler, assistant traffic manager, Koppers Co.; J. L. O'Toole, chairman of the railroad contact committee; A. R. Kennedy, traffic manager, Pittsburgh Steel Co.; W. J. McGarry, Washington, manager, car service division, the Association of American Railroads, and H. B. Kirkpatrick, president, Pittsburgh Chamber of Commerce.

PERSONALS



WILLIAM P. EWING



L. W. BRIGGS

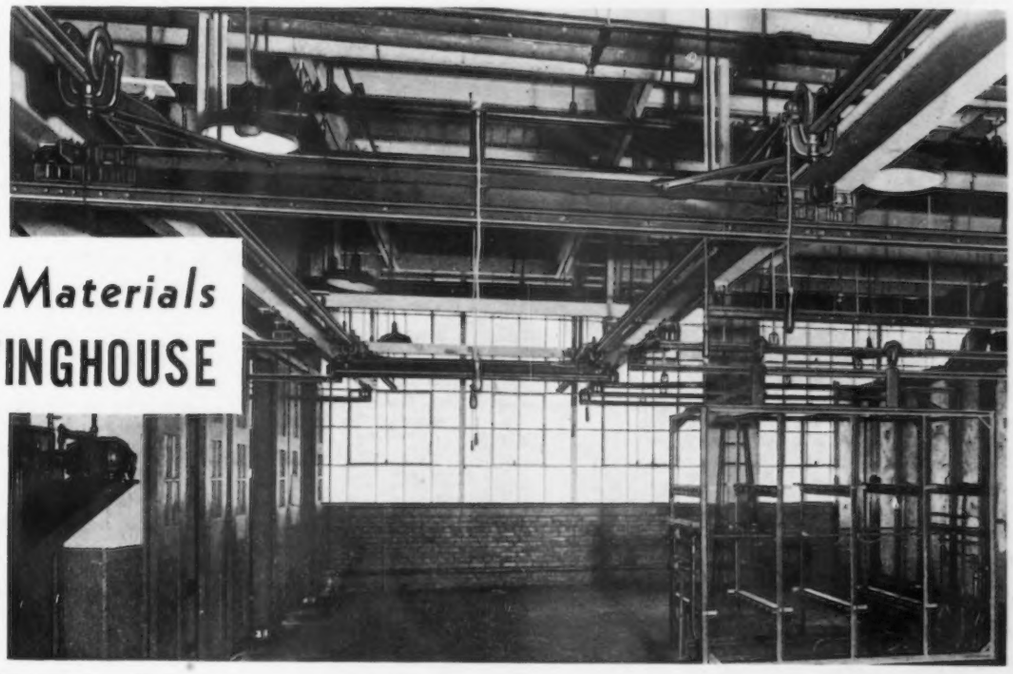


DAVID FRYDE

WILLIAM P. EWING, whose appointment as executive vice-president of the Superior Steel Corp., Pittsburgh, was announced in THE IRON AGE last week, has been with the company since May, 1918. He spent five years in various capacities at the plant, and has been in the sales department since 1924. In 1930 he was appointed assistant manager of sales, and later promoted to the position of manager of sales. Last October he was made vice-president in charge of sales.

L. W. BRIGGS, who has been made vice-president in charge of sales, was until last month general sales manager for the West Leechburg Steel Co., Pittsburgh, which is soon to be merged with Allegheny Steel Co. After being graduated from Swarthmore College in 1917, Mr. Briggs joined the West Leechburg Steel Co. and served in various capacities in the sales department, having been located in Detroit and Chicago. Two and a half years ago he was transferred to Pittsburgh as general manager of sales.

DAVID PRYDE, who was elected vice-president in charge of operations, began his steel career in 1894 with the Edgar Thomson works of Carnegie Steel Co., Braddock, Pa., serving in the mechanical engineering department. He served in various capacities for the Carnegie company until January, 1928, when he became manager of works for the Superior corporation at Carnegie, Pa., which position he held up until the time of his elec-



Handling Materials for **WESTINGHOUSE**

In nine of the Westinghouse plants American MonoRail equipment handles materials through various processes. The above picture shows special cranes interlocking at both ends with MonoRail tracks to provide flexible handling. Let our engineers recommend a labor-saving, cost-reducing system for handling your product.

Write for new book on MonoTractor drive for Overhead Handling

THE AMERICAN MONORAIL CO.

13103 Athens Ave., Cleveland, O.

tion as vice-president. He is also one of the directors of the corporation.

NORMAN D. CARPENTER has been appointed assistant vice-president. He was formerly connected with West Leechburg Steel Co. as traffic manager until May, 1934, when he was made district sales manager. JOHN N. KERR has been named manager of carbon steel sales for the Superior company. He was formerly with West Leechburg Steel Co. and spent 11 years in the operating department and the past five years in sales. At the time he left the West Leechburg company he was assistant general sales manager. WALTER G. BLUME has been appointed manager of stainless steel sales. Since 1917 he has been with the Superior company, and has spent considerable time in the operating department. In 1934 he was appointed assistant manager of sales, and remained in this position until his recent appointment. WILLIAM B. HOLT, appointed general superintendent, entered the employ of the company as an order clerk in October, 1904. In 1921 he was made assistant works manager, later being promoted to production manager in 1928. KENNETH W. MASSEY has been named manager of development and research, and has been with the company since 1926, having served as district sales representative in Connecticut, and later as assistant to the president.

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CARL H. MORKEN, since 1930 foundry engineer of the Detroit Electric Furnace Co., Detroit, has been appointed director of engineering sales for the Carondelet Foundry Co., St. Louis. He was graduated from the University of Minnesota in 1922 as a chemical engineer and for the following three years was identified with several foundries in Minneapolis. He became plant metallurgist for the Ohio Brass Co., Mansfield, Ohio, in 1925 and joined the Detroit Electric Furnace Co. five years later.

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J. C. NELSON has been elected president and general manager of the Easy Washing Machine Corp., Syracuse, N. Y. H. L. BABCOCK has been made vice-president and treasurer and H. PAUL NELLIGAN, vice-president and general counsel.

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MYRON C. TAYLOR, chairman of the board of the United States Steel Corp., sailed for Europe on June 20, following his usual custom of visiting the offices of the corporation in the principal European countries.

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GEORGE ENDICOTT has joined the engineering staff of the Morgan Construction Co., Worcester, where he will be associated with the design and production of bearings and other rolling mill machinery. He was graduated from Stevens Institute of Technology in 1915 and, after serving with the Morgan Spring Co., he was identified with the Wickwire Spencer Steel Co., as assistant to the vice-president in charge of operations from 1918 to 1926. During the past 10 years he has been engaged in reorganization work and in consulting practice.

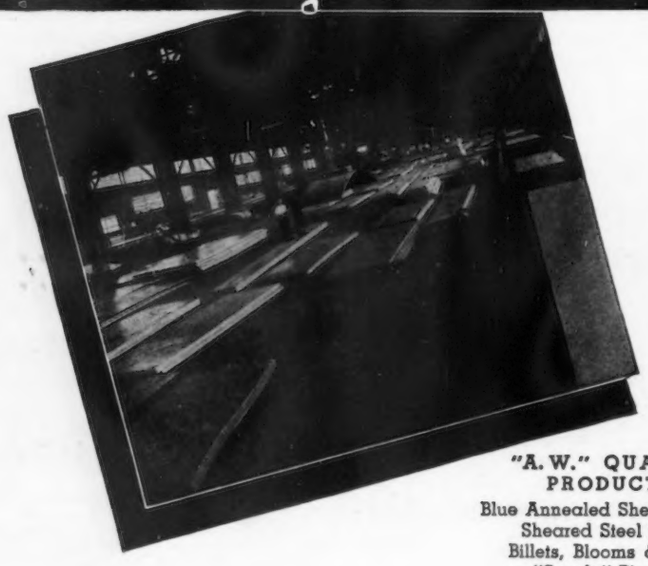
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GEORGE M. SNODGRASS, for the past 15 years associated with Fairbanks-Morse & Co., latterly as general sales manager of the electrical division, has been appointed general sales manager of the Imperial Electric Co., Akron, Ohio.

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J. W. GLEASON, who has resigned as general manager of Knapp

"A.W." DEPENDABLE PROMPT SERVICE



"A.W." QUALITY PRODUCTS

Blue Annealed Sheets & Strip
Sheared Steel Plates
Billets, Blooms & Slabs
"Swede" Pig Iron

"A.W." Rolled Steel Floor Plate

"A.W." - "70-90" Super Strength Steel

"A.W." Service includes immediate deliveries from ample standard stocks maintained by distributors and warehouses in principal cities, as well as prompt execution of special mill orders.

And the competent services of our Metallurgical and Engineering Departments are freely offered in applying "A.W." products to the more efficient and economical solution of your problems.

ALAN WOOD STEEL COMPANY
CONSHOHOCKEN, PA.
BRANCHES:
Philadelphia, New York, Boston, Los Angeles, San Francisco, Seattle, Houston

110 YEARS' IRON- AND STEEL-MAKING EXPERIENCE

Brothers Mfg. Co., Joliet, Ill., has become identified with the Chicago branch of the Rawlplug Co., Inc., New York. He was assistant general sales manager of the Kalman Steel Co. for five years and before that was identified with the General Fireproofing Co., for seven years.

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J. GORDON SMITH, formerly district manager for eastern New York, for the Porter-Cable Machine Co., Syracuse, N. Y., has been promoted to the position of assistant sales manager in charge of field sales promotion and the coordination of activities of representatives.

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V. C. HOGREN, for the past few years identified in a sales promotion capacity with the New York office of the Acme Steel Co., Chicago, has been appointed advertising manager.

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GEORGE C. MERCER has been appointed general purchasing agent for P. R. Mallory & Co., Inc., Indianapolis.

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J. LESLIE LENTON has been appointed direct Western representative, with headquarters in Chicago, for the New Britain-Gridley Machine Co., New Britain, Conn.

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G. H. SHILL has been placed in charge of the manufacturing and engineering activities of the plastics department of the General Electric Co. The activities of the department have been coordinated under the direction of C. E. WILSON, vice-president of the company.

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B. S. STEPHENSON, vice-president of the American Radiator & Standard Sanitary Corp., New York, has been made a member of the board of directors of the Purchasing Agents Association of New York.

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J. C. BLOOMFIELD has joined the shovel, drag line and crane sales division of Link-Belt Co., Chicago, where he will specialize in the application of Link-Belt machines to railroad service. L. P. STILLAN, for many years a member of the department, has been appointed shovel and crane division sales manager in charge of sales to contractors, with full supervision over all sales agents and distributers. N. A. WESTON has been given charge of shovel division industrial sales in the Chicago sales district, and G. H. OLSON is now the company's shovel and crane division general manager.



L. B. SCHUMACKER whose appointment as manager of sales, reinforcing division, Truscon Steel Co., Youngstown, was announced in these columns last week. Prior to his connection with the Jones & Laughlin Steel Corp., he was identified with the Illinois Steel Co. and Laclede Steel Co.

CHARLES L. SPATHOLT has been appointed district sales manager at Milwaukee for the Truscon Steel Co., Youngstown. He succeeds W. L. GLASER, who will remain in the Milwaukee office as assistant to Mr. Spatholt.

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JOSEPH F. BODE, of the Briggs & Stratton Corp., Milwaukee, has been elected president of the Milwaukee Association of Purchasing Agents. Other new officers are: Vice-president, HENRY A. STEFFEN, Wadhams Oil Co.; secretary, C. C. BREMER, Interstate Drop Forge Co.; treasurer, THEODORE H. SCHULTHEIS, J. Rauschenberger Rope Co.; national director, T. C. CHILD, Allen-Bradley Co.; local director, C. A. KELLY, Bucyrus-Erie Co.



OLIVER C. HENKEL, whose appointment as district sales manager in the New York metropolitan area for the Empire Sheet & Tin Plate Co. was announced in these columns last week.

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L. P. KALB, formerly chief engineer of the Continental Motors Corp., Muskegon, Mich., has been named vice-president in charge of manufacturing and engineering of the company. CLARENCE REESE has been designated vice-president and assistant general manager. WM. R. ANGELL, president, has assumed the office of treasurer in addition to that of president.

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FRANK J. WOOD, for the past two years brass mill engineer for the Western Cartridge Co., has been appointed chief engineer of the industrial manufacturing division of the Goodman Mfg. Co., Chicago. Prior to 1934 he spent a year in Russia as rolling mill consultant for the Freyn Engineering Co. and for five years previous he was with the Mesta Machine Co.

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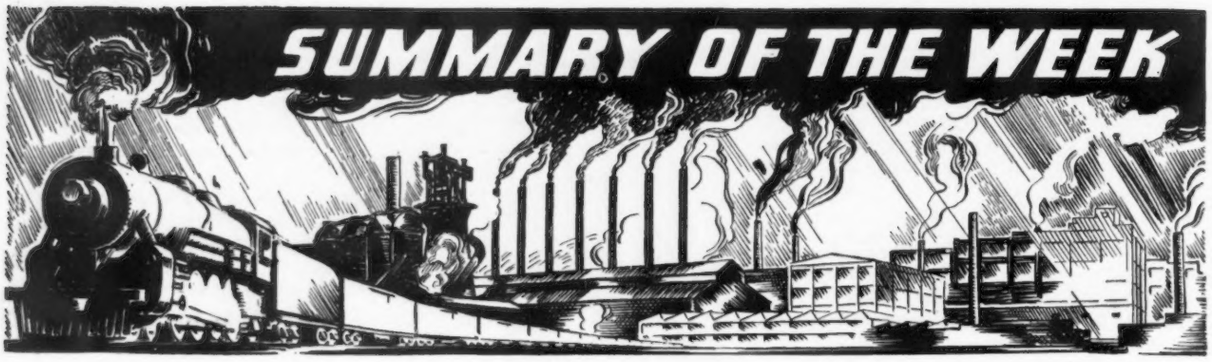
JOSEPH A. SCOTT, melting foreman of the Driver Harris Co., Harrison, N. J., has been elected president of the Electric Metal Makers Guild. DAVID J. GILES, works manager, Latrobe Electric Steel Co., Latrobe, Pa., is vice-president of the guild, and J. H. CHIVERS, melting foreman, Braeburn Alloy Steel Co., Braeburn, Pa., is secretary-treasurer.

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EDWARD A. LIVINGSTONE, who has been engaged in special sales work in the oil industry for the Babcock & Wilcox Tube Co., Beaver Falls, Pa., has been appointed manager of alloy tube sales. Before becoming identified with the company in 1933, he was successively district sales manager for the A. O. Smith Corp. in Los Angeles, Tulsa, Okla., and New York.

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E. J. GOES, of the Koehring Co., Milwaukee, has been elected president of the Milwaukee chapter, National Association of Industrial Advertisers. He succeeds ARNOLD ANDREWS, Bucyrus-Erie Co. DELBERT KAY, Nordberg Mfg. Co., was chosen vice-president; VAN B. HOOPER, Louis Allis Co., secretary-treasurer, and WOOD SANFORD, Harnischfeger Corp., director.



. . . Mills check second quarter buying with rolling schedules assured for several weeks.

o o o

. . . Steel output is maintained at 71 per cent of capacity.

o o o

. . . Labor unrest, Government hostility and anticipatory buying affect long-term outlook of steel industry.

WHILE steel production is maintained at 71 per cent of capacity and the current situation is highly satisfactory, the long-term outlook is far from encouraging. Higher ingot output at Chicago and Cleveland has more than offset declines at Pittsburgh and Birmingham, but the peak of forward buying at second quarter prices has passed and the summer outlook is clouded by ominous uncertainties.

The labor situation probably heads the list of disturbing factors. The Lewis Committee for Industrial Organization, backed by ample funds, has begun its aggressive unionization drive. One major steel plant has been closed by a strike for a full month. Heavy consumer buying from a number of sources is admittedly prompted by the fear of labor trouble, as well as by higher third quarter prices.

SERIOUS consideration is unquestionably being given to wage advances. While such action may be postponed until higher prices actually become effective, increasing unrest in employee ranks may force premature action. It is now generally admitted that the higher prices announced recently anticipated wage increases, but the narrow profit margins obtained by major steel producers would have been turned into losses had the procedure been reversed.

EVEN more serious is the growing hostility of the Federal Government. The Federal Trade Commission's report on alleged collusive bidding by steel sheet piling makers and its hasty acceptance by the Administration for obvious political purposes indicate quite clearly that the steel industry has already been singled out as the whipping boy of the political campaign. Proposed settlement of the FTC's case against the tin plate makers with a consent decree will only add fuel to the fire.

Of even more practical significance is the fact that fully half of the steel tonnage booked during June has been prompted by price advances. While the current week has brought a sharp curtailment in this kind of business because many companies are closing their books against further forward purchases, it cannot be denied that a large proportion of production during June has been borrowed from July and August.

ON the credit side of the ledger is the well-sustained level of general industrial activity. THE IRON AGE index of capital goods activity advanced two points last week to 78 per cent of the 1925-27 average. It thus approached its January peak and topped the high mark of the spring. It remains to be seen whether or not anticipatory buying will nullify the effects of this influence during late July and August.

SUSTAINED automotive activity and increased railroad purchases remain the outstanding factors in the present steel situation. The former is unquestionably affected by bonus payments and latter derives support from higher third quarter prices. Freight car orders include 2820 for the Southern Pacific, 1000 for the Wheeling & Lake Erie, and 700 for the Northern Pacific, while new inquiries invoive 1200 units.

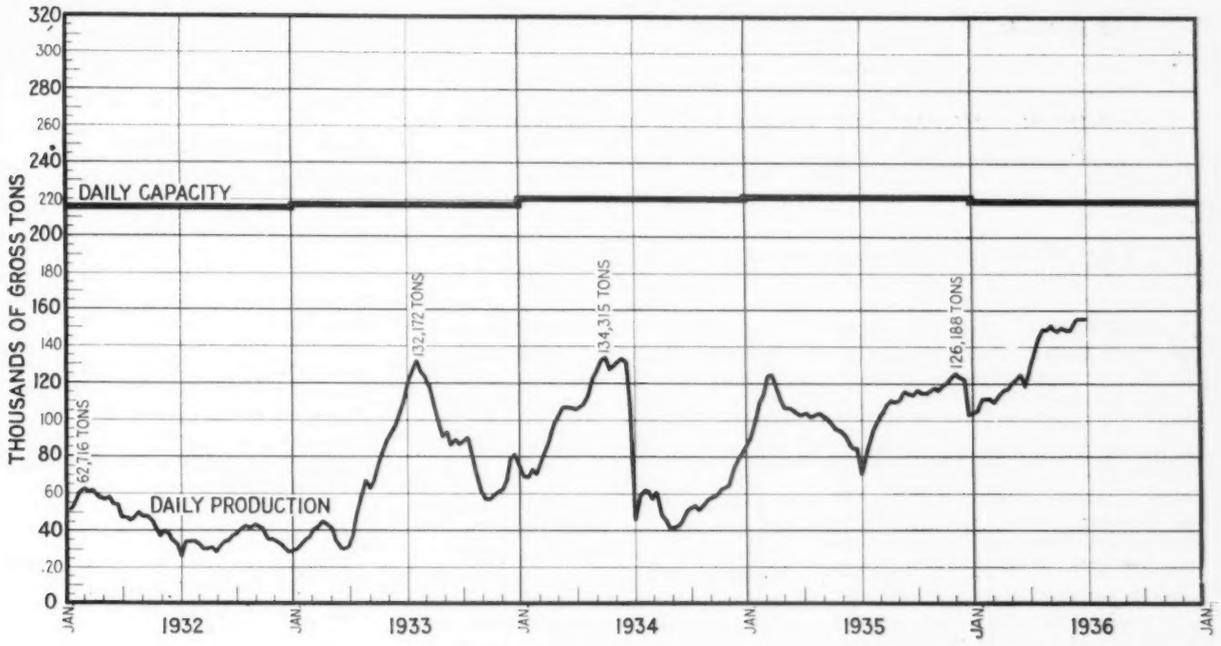
Fabricated structural steel lettings have declined from 25,410 tons to 16,140 tons, but new projects have increased from 18,450 to 30,500 tons. Practically all of the new work coming out for bids represents coverage in anticipation of higher prices and all of the inquiries will not result in orders.

THE scrap market has taken on new life because of continued heavy spot demand. However, it is generally conceded that healthy improvement cannot be expected before fall, and THE IRON AGE composite is unchanged at $12.75 a gross ton. The pig iron composite is also holding at $18.84 a gross ton, while the lack of steel buying at third quarter levels prevents an advance in the finished steel composite from the 2.097c. a lb. level.

STEEL INGOT PRODUCTION

Daily Tonnage of Bessemer and Open-Hearth Steel Ingots Produced by Weeks, 1932-1936

Current Week	Last Week	Weeks Ended June 29, 1935	June 30, 1934	July 1, 1933	July 2, 1932
155,826	155,826	84,125	105,691	110,505	32,439



STEEL INGOT PRODUCTION BY DISTRICTS: Per Cent of Capacity

District	Current Week	Last Week	Weeks Ended May 30, 1936	June 29, 1935	June 30, 1934
Pittsburgh	65.0	67.0	63.0	32.0	42.0
Chicago	74.0	71.0	65.0	41.0	52.0
Valleys	75.0	75.0	74.0	43.0	50.0
Philadelphia	46.0	46.0	44.0	30.0	45.0
Cleveland	79.0	76.0	72.0	41.0	54.0
Buffalo	85.0	85.0	76.0	32.0	45.0
Wheeling	96.0	96.0	90.0	48.0	63.0
Southern	57.0	67.0	67.0	25.0	63.0
Ohio River	67.0	63.5	77.0	50.0	40.0
Western	80.0	80.0	77.5	30.0	35.0
St. Louis	87.5	90.0	82.0	33.0	35.0
Detroit	100.0	100.0	100.0	95.0	100.0
Eastern	90.0	90.0	85.0	35.0	50.0
Aggregate	71.0	71.0	68.0	38.0	48.0
Average Year to Date	60.7	60.3	59.0	46.4	48.4

Weekly Booking of Construction Steel

From THE IRON AGE

	Week Ended June 23, 1936	June 16, 1936	May 26, 1936	June 25, 1935	Year to Date 1936	1935
Fabricated structural steel awards	16,140	25,410	11,900	27,000	505,420	389,795
Fabricated plate awards	7,235	2,965	555	1,620	133,630	84,880
Steel sheet piling awards	2,450	625	0	1,240	20,840	25,185
Reinforcing bar awards	5,000	1,140	5,760	3,000	170,995	121,455
Total Lettings of Construction Steel	30,825	30,140	18,215	32,860	830,885	621,315



. . . Steel output recedes as mills close second quarter books.

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. . . General demand for immediate consumption is well maintained.

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. . . Tin plate production recedes slightly.

PITTSBURGH, June 23.—Steel ingot output in the Pittsburgh district has suffered a setback, and as a result is down two points this week to 65 per cent. This drop is traceable to a lower operating rate on the part of the leading interest, since independents are maintaining their recent high levels. The Wheeling district is unchanged this week at 96 per cent.

It is possible that steel production might rise one or two points before the end of this month. However, the peak has probably been reached for the time being. Present production figures are the best since the second week in June, 1930, and while it is true that the maintenance of these levels can be traced to anticipatory buying, considerable tonnages have been ordered for immediate consumption, indicating that general underlying recovery in business has been reflected in steel operations over the past several months.

As a result of these factors, the general opinion is that summer business will not be at as low an ebb as was thought a few months ago.

Specifications on practically all steel items have shown improvement during the past week. Mills in many cases are facing practical difficulties in their attempts to schedule rolling mill operations. It is hardly possible that shipments will be completed by the end of this month. More likely it will be the middle of July before the majority of producers have cleaned up on second quarter business.

Outstanding activity this week is to be found in the semi-finished category, and the ordering on the part of cold-finished material customers is as good as at any time since 1930. A large percentage of the latter business is attributable to forward buying, while non-integrated manufacturers are taking in heavy tonnages of semi-finished material for the same reason.

Mills producing hot-rolled bars are being swamped with specifications, with the result that finishing mill operations are difficult to schedule, and a fairly large backlog is now in evidence. A slight improvement was discernible last week in merchant wire business, and there is a possibility for its continuance during the rest of this month.

Sheet operations are up five points to 68 per cent, due to heavier specifications which are of an anticipatory nature. The break-neck operating rate in the tin plate industry has come to an end for the time being, at least, since operations have dropped to approximately 98 per cent.

Warehouses have announced third quarter prices, effective July 1, which disclose a $2 increase on hot-rolled items and a $3 increase on cold-finished material.

The raw material markets are quiet and firm. There is considerable speculation as to whether by-product coke makers will have enough supplies to build up their accumulations for next fall's domestic trade.

Pig Iron

Specifications and shipments continue along recent levels, with no outstanding development in this market. The local merchant furnace is operating at practical capacity, with large customers specifying by carload lots. It is apparent that this situation will not change for the next month or so. Steadiness of prices precludes any immediate forward buying, and there is no indication at this time whether quotations will be raised later in the year.

Semi-Finished Steel

Aggregate volume of specifications this week is on a par with that previously reported. Mills are taxed to the utmost in getting out shipments to non-integrated mills, and this trend will continue during the balance of the month. A large measure of the sharp improvement in this market is attributable to forward buying.

Bolts, Nuts and Rivets

Demand is well sustained this week and, if anything, shows a slight improvement. Fair tonnages are still being placed by car builders and railroad repair shops continue to specify freely. During the past week fair-sized orders were received from automobile interests, apparently for 1937 models. Customers' reaction on the recent announcements of increased prices is favorable, and producers are beginning to receive third quarter contracts.

Bars

Producers are being swamped with specifications, and as a result mills are getting further behind in their deliveries. Sources of orders coming in show a wide diversification, and there is considerable tonnage being booked by makers of cold-finished bars. While a goodly amount of forward buying, in order to take advantage of the price increase, is undoubtedly taking place, nevertheless the majority of tonnages moving at this time can safely be said to be for immediate consumption. It is expected that the end of this week will see further increases in both specifications and shipments, and it is apparent that the mills' inability to cope with the practical difficulties of production will necessitate some shipping being done in the early part of July.

Steel Sheet Piling

While shipments are rather light this week, several projects are in the process of being awarded, and further improvement in this market is expected momentarily. The Inland Steel Co. has received the award for 502 tons of steel sheet piling to be used by the War Department at Canal Point, Fla. The desilting works, Loup River Public Power District project, will be readvertised on June 27, due to the bids on the 628 tons of piling having been over the appropriation. Of exceptional interest is the

A Comparison of Prices

Market Prices at Date, and One Week, One Month, and One Year Previous: Advances Over Past Week in Heavy Type, Declines in Italics

Rails and Semi-finished Steel

Per Gross Ton:	June 23, 1936	June 16, 1936	May 26, 1936	June 25, 1935
Rails, heavy at mill	$36.37½	$36.37½	$36.37½	$36.37½
Light rails, Pittsburgh	35.00	35.00	35.00	35.00
Rerolling billets, Pittsburgh	28.00	28.00	28.00	27.00
Sheet bars, Pittsburgh	28.00	28.00	28.00	28.00
Slabs, Pittsburgh	28.00	28.00	28.00	27.00
Forging billets, Pittsburgh	35.00	35.00	35.00	32.00
Wire rods, Nos. 4 and 5, Pgh.	38.00	38.00	38.00	38.00
	Cents	Cents	Cents	Cents
Skelp, grvd. steel, P'gh. lb.	1.80	1.80	1.80	1.70

Finished Steel

Per Lb.:	Cents	Cents	Cents	Cents
Bars, Pittsburgh	1.85	1.85	1.85	1.80
Bars, Chicago	1.90	1.90	1.90	1.85
Bars, Cleveland	1.90	1.90	1.90	1.85
Bars, New York	2.20	2.20	2.20	2.15
Plates, Pittsburgh	1.80	1.80	1.80	1.80
Plates, Chicago	1.85	1.85	1.85	1.85
Plates, New York	2.09	2.09	2.09	2.09
Structural shapes, Pittsburgh	1.80	1.80	1.80	1.80
Structural shapes, Chicago	1.85	1.85	1.85	1.85
Structural shapes, New York	2.06¼	2.06¼	2.06¼	2.06¼
Cold-finished bars, Pittsburgh	2.10	2.10	2.10	1.95
Hot-rolled strips, Pittsburgh	1.85	1.85	1.85	1.85
Cold-rolled strips, Pittsburgh	2.60	2.60	2.60	2.60
Hot-rolled annealed sheets, No. 24, Pittsburgh	2.40	2.40	2.40	2.40
Hot-rolled annealed sheets, No. 24, Gary	2.50	2.50	2.50	2.50
Sheets, galv., No. 24, P'gh	3.10	3.10	3.10	3.10
Sheets, galv., No. 24, Gary	3.20	3.20	3.20	3.20
Hot-rolled sheets, No. 10, Pittsburgh	1.85	1.85	1.85	1.85
Hot-rolled sheets, No. 10, Gary	1.95	1.95	1.95	1.95
Cold-rolled sheets, No. 20, Pittsburgh	2.95	2.95	2.95	2.95
Cold-rolled sheets, No. 20, Gary	3.05	3.05	305	3.05
Wire nails, Pittsburgh	2.10	2.10	2.10	2.60
Wire nails, Chicago dist. mill	2.15	2.15	2.15	2.65
Plain wire, Pittsburgh	2.40	2.40	2.40	2.30
Plain wire, Chicago dist. mill	2.45	2.45	2.45	2.35
Barbed wire, galv., Pittsburgh	2.60	2.60	2.60	3.00
Barbed wire, galv., Chicago dist. mill	2.65	2.65	2.65	3.05
Tin plate, 100 lb. box, P'gh	$5.25	$5.25	$5.25	$5.25

On export business there are frequent variations from the above prices. Also in domestic business, there is at times a range of prices on various products, as shown in our detailed price tables.

Pig Iron

Per Gross Ton:	June 23, 1936	June 16, 1936	May 26, 1936	June 25, 1935
No. 2 fdy., Philadelphia	$21.3132	$21.3132	$21.3132	$20.3132
No. 2, Valley furnace	19.50	19.50	19.50	18.50
No. 2, Southern Cin'ti	20.2007	20.2007	20.2007	19.2007
No. 2, Birmingham†	15.50	15.50	15.50	14.50
No. 2, foundry, Chicago*	19.50	19.50	19.50	18.50
Basic, del'd eastern Pa.	20.8132	20.8132	20.8132	19.8132
Basic, Valley furnace	19.00	19.00	19.00	18.00
Malleable, Chicago*	19.50	19.50	19.50	18.50
Malleable, Valley	19.50	19.50	19.50	18.50
L. S. charcoal, Chicago	25.2528	25.2528	25.2528	24.2528
Ferromanganese, seab'd carlots	75.00	75.00	75.00	85.00

† This quotation is for delivery in South; in the North prices are 38c. a ton under delivery quotations from nearest Northern furnace.

* The switching charge for delivery to foundries in the Chicago district is 60c. per ton.

Scrap

Per Gross Ton:				
Heavy melting steel, P'gh	$13.50	$13.50	$14.25	$11.75
Heavy melting steel, Phila.	12.00	12.00	12.25	10.50
Heavy melting steel, Ch'go	12.75	12.75	12.75	9.87½
Carwheels, Chicago	13.50	13.50	13.50	10.50
Carwheels, Philadelphia	13.75	13.75	13.75	11.25
No. 1 cast, Pittsburgh	14.75	14.75	15.25	13.25
No. 1 cast, Philadelphia	14.00	14.00	14.00	11.25
No. 1 cast, Ch'go, (net ton)	12.00	12.00	12.00	9.00
No. 1 RR. wrot., Phila.	14.75	14.75	14.75	10.25
No. 1 RR. wrot., Ch'go, (net)	11.50	11.50	11.50	7.75

Coke, Connellsville

Per Net Ton at Oven:				
Furnace coke, prompt	$3.65	$3.65	$3.65	$3.50
Foundry coke, prompt	4.25	4.25	4.25	4.00

Metals

Per Lb. to Large Buyers:	Cents	Cents	Cents	Cents
Electrolytic copper, Conn.	9.50	9.50	9.50	8.75
Lake copper, New York	9.62½	9.62½	9.62½	9.12½
Tin (Straits), New York	42.62½	41.62½	46.00	51.25
Zinc, East St. Louis	4.85	4.90	4.90	4.30
Zinc, New York	5.22½	5.27½	5.27½	4.67½
Lead, St. Louis	4.45	4.45	4.45	3.85
Lead, New York	4.60	4.60	4.60	4.00
Antimony (Asiatic), N. Y.	13.00	13.00	13.50	12.75

The Iron Age Composite Prices

	Finished Steel	Pig Iron	Steel Scrap
June 23, 1936	2.097c. a Lb.	$18.84 a Gross Ton	$12.75 a Gross Ton
One week ago	2.097c.	18.84	12.75
One month ago	2.097c.	18.84	13.08
One year ago	2.124c.	17.84	10.71
	Based on steel bars, beams, tank plates, wire rails, black pipe, sheets and hot-rolled strips. These products represent 85 per cent of the United States output.	Based on average of basic iron at Valley furnace and foundry irons at Chicago, Philadelphia, Buffalo, Valley and Birmingham.	Based on No. 1 heavy melting steel quotations at Pittsburgh, Philadelphia and Chicago.

	Finished Steel		Pig Iron		Steel Scrap	
	High	Low	High	Low	High	Low
1936	2.130c., Jan. 7	2.084c., Mar. 10	$18.84, Jan. 7	$18.84, Jan. 7	$14.75, Feb. 25	$12.67, June 9
1935	2.130c., Oct. 1	2.124c., Jan. 8	18.84, Nov. 5	17.83, May 14	13.42, Dec. 10	10.33, April 23
1934	2.199c., April 24	2.008c., Jan. 2	17.90, May 1	16.90, Jan. 27	13.00, Mar. 13	9.50, Sept. 25
1933	2.015c., Oct. 3	1.867c., April 18	16.90, Dec. 5	13.56, Jan. 3	12.25, Aug. 8	6.75, Jan. 3
1932	1.977c., Oct. 4	1.926c., Feb. 2	14.81, Jan. 5	13.56, Dec. 6	8.50, Jan. 12	6.43, July 5
1931	2.037c., Jan. 13	1.945c., Dec. 29	15.90, Jan. 6	14.79, Dec. 15	11.33, Jan. 6	8.50, Dec. 29
1930	2.273c., Jan. 7	2.018c., Dec. 9	18.21, Jan. 7	15.90, Dec. 16	15.00, Feb. 18	11.25, Dec. 9
1929	2.317c., April 2	2.273c., Oct. 29	18.71, May 14	18.21, Dec. 17	17.58, Jan. 29	14.08, Dec. 3
1928	2.286c., Dec. 11	2.217c., July 17	18.59, Nov. 27	17.04, July 24	16.50, Dec. 31	13.08, July 2
1927	2.402c., Jan. 4	2.212c., Nov. 1	19.71, Jan. 4	17.54, Nov. 1	15.25, Jan. 11	13.08, Nov. 22

inquiry from the Marine Parkway Authority for a substructure, involving 2200 tons, in connection with the bridge over Rockaway Inlet, New York. Bids were accepted on June 24.

Cold-Finished Bars

Specifications are coming in at an extremely high rate, due to forward purchases on the part of practically all consumers. While no one interest is outstanding, considerable tonnage is being booked by washing machine makers, electrical appliance people and implement makers. Mill backlogs are becoming exceptionally heavy, and this month promises to be as good, if not better, than any 30-day period since early 1930. Since cold-finished material is going up $3 a ton, obviously the majority of bookings at this time are of an anticipatory nature. However, requirements for such material are known by producers, and there does not seem to be much purely speculative buying.

Reinforcing Steel

Second quarter quotations have been reaffirmed for third quarter delivery in this market, with 2.05c., Pittsburgh, being the base price to consumers. Jobbers will get the usual discount on 40, 50 and 60-ft. lengths, and will pay the 10c. extra for cut lengths. Meanwhile mills are actively engaged getting out material on recent releases.

Plates and Shapes

Demand for plates and shapes is holding up well. There is considerable activity in tank car requirements, and within the past week or so, there were additional inquiries for railroad cars. The Wheeling & Lake Erie Railroad ordered 1000 cars recently. Producers here expect to maintain rigidly the 30 days' grace allowed on identified jobs; that is, consumers must place their contracts some time within 30 days after awards have been made. They reserve the right, once contracts are placed, to specify throughout the life of the job.

Tubular Products

Considerable movement of standard pipe to the trade has taken place from jobbers' warehouses, and as a result producers are receiving a greater number of specifications from the latter. This condition is encouraging, since it indicates a slight improvement in both building and rehabilitation. Oil-country goods remain at recent levels, with no immediate indication of a sharp let down. Specifications and shipments of mechanical tubing have shown a slight improvement over the past week or so.

Wire Products

Specifications for manufacturing wire remain steady. Resale prices in the merchant wire business continue to show improvement. The small pick-up noted in this classification of wire products is still in evidence this week, and there is a fair possibility that it will either remain at the present level or show further improvement by the first of the month.

Warehouse Business

As was expected, warehouses have announced increased prices, effective July 1. Hot-rolled products have been increased $2 per ton, while cold-finished material will go up $3, in line with recent announcements by producers. The warehouse business in this district has been exceptionally good in comparison over the past two months, and there is no immediate let down in evidence at this time. The month of June will probably run as good as May, with a slowing up occurring in July.

Sheets

Bookings from practically all sources have increased this week, as consumers rush to cover at present prices. Substantial tonnages have been placed by car roofers for immediate consumption. Orders from refrigerator, stove, furniture and electrical equipment manufacturers have been received in good volume over the past week. While producers will attempt to clean up all shipments as soon as possible after the end of the month, it is becoming increasingly apparent that the heavy volume of backlogs will result in some shipments being released in the early part of July. One large producer notified its district offices last week that no new business would be taken at second quarter prices after June 20. Meanwhile operations have advanced five points to 68 per cent of capacity.

Tin Plate

Specifications from can makers have not necessarily been much larger than last year. The reason for the exceptional operating rate may be found in the increased uses of tin plate. A substantial increase in tonnage going into small oil cans, coupled with the almost 100 per cent improvement in requirements from beer can makers, are the main causes for the present bulge in tin plate production, which incidentally might break all records this year. Can makers report at this time very good prospects for crops. The pea crop, which did not turn out so well last year, is expected to show substantial improvement this year. Operations are down slightly this week and average between 95 and 98 per cent of capacity.

Strip Steel

Further substantial improvement in strip steel specifications has occurred over the past week. Sources are well diversified, and there are plenty of indications that a desire on the part of consumers to take advantage of savings is the cause of the sharp upturn. Mill backlogs are exceptionally heavy, and some producers will find it impossible to complete shipments by the end of this month.

Coal and Coke

Movement of foundry coke persists at a satisfactory rate, with no indications of any immediate let-up. Merchant by-product plants are for the most part running at capacity, and in those cases where there is an acute shortage, beehive coke is being used. The movement of coal to the Lakes from this district is still far from what producers think it should be. One cause of this lack of movement is due to the reluctance of buyers to take any more coal than is necessary, until the 5c. freight reduction takes effect on July 1. After that time it is the opinion here that a greatly accelerated shipment will take place.



. . . *Pig iron sales in large volume.*

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. . . *Steel ingot output maintained.*

BUFFALO, June 23. — Buffalo steel mill operations continue at the same pace as last week, with Bethlehem's Lackawanna plant operating 22 open hearths; Republic Steel Corp., 7, and Wickwire-Spencer, 2. Seneca sheet division continues at 85 per cent of capacity.

A Buffalo concern will fabricate 220 tons of structural steel for a new drug warehouse for McKesson & Robbins. Two sizable reinforcing bar awards were made by the general contractors having division of the Buffalo sewer construction. One contract calls for 800 tons and the other for 200 tons. Smaller-sized reinforcing bar and structural steel business is moving freely.

Pig iron business is in good volume, with several sizable lots, as high as 2000 tons, being placed.



. . . Steel production advances to 74 per cent of capacity.

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. . . Freight car awards are heavy.

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. . . Road machinery and farm implement plants are buying in large volume.

CHICAGO, June 23.—Ingot output is surging upward as mills strive to meet their heavy obligations against orders taken at second quarter prices. The rate is now 74 per cent of capacity, a gain of three points from last week.

Consumers are still putting pressure on for additional commitments at the low prices but each day finds producers closing books on items which cannot be delivered in the coming month. This does not apply to specified projects on which deliveries can be made beyond the limitations set for the ordinary run of business.

Outstanding in the week's news are actions taken by railroads on needed equipment. The Southern Pacific has placed 2820 cars and the Union Pacific has ordered 1000 underframes. The Northern Pacific has made known its need for steel for 700 cars and plans for heavy repairs and car construction in railroad shops remain active. These orders, plus those which have gone before, are being felt throughout the railway supply field. Steel foundries, some of which have not been in use for several years, are resuming operations and some malleable shops report the best business since 1929.

Many structural projects are coming to the fore as both Government spenders and a few private buyers rush to take advantage of the old prices. Several road machinery builders report full schedules for the next 60 days and farm implement plants are reaching out for steel in such quantity as to give proof of their confidence. Steel producers can visualize nothing other than a high rate of ingot production throughout most if not all of the summer period.

Pig Iron

Contracting is moving forward at a steady pace and shipments are above the May average. Use by automobile plants is off but railroad equipment, road machinery and the general run of foundry business are more than making up that drop. Steel foundries are particularly optimistic and malleable shops report excellent orders and a bright outlook.

Cast Iron Pipe

Cicero, Ill., has closed for 6000 tons and only formal signatures remain to be attached to contracts for the remainder of the Chicago tonnage. The Peoples Gas, Light & Coke Co., Chicago, is buying off and on for extensions throughout the city. Small projects, financed with Government funds, are slowing down and except for the matter of shipments, there is little of prime importance in sight for the summer months. Dry weather has been and still is contributing to fast schedules on all pipe-laying operations.

Reinforcing Bars

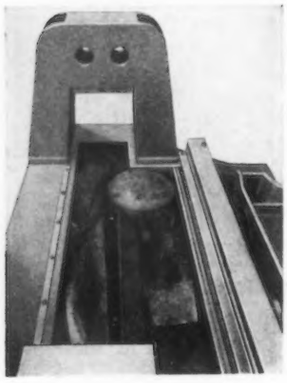
Extended mill shipments are irksome to many users who in their anxiety to obtain bars when needed are breaking from old connections in efforts to catch suitable rolling schedules. Neither sales nor fresh inquiries are important this week but dealers look upon the situation as a temporary lull. Chicago is attempting to obtain Government funds for a school-building program; Mississippi River work is again under way, and there is a large tonnage of bars in highway bridge work if plans made last winter are carried through. Not all dealers are conforming to the published price idea.

Plates

This market is experiencing its liveliest session in several years,

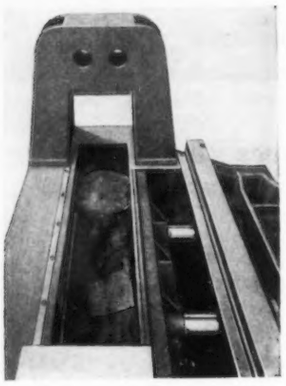


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the underlying causes being the price advance, which has been and still is driving many specific jobs to makers' books. Also, there is more of the day-to-day run of business which has been lacking throughout most of the depression period. A new outlet for plates is a western manufacturer who is going into welded well casing in a large way. Specifications for materials for the Chesapeake & Ohio cars are now reaching mills and new car business is extremely important. The Southern Pacific has ordered 2820 cars, the Union Pacific has placed 1000 steel underframes, the Northern Pacific has ordered 500 gondolas and will build 200 flat cars in its own shops, and the Texas, New Orleans & Mexico is in the market for 200 cars. Local mills estimate that not less than 85,000 tons of car materials will soon flow to shops.

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Structural Steel

From the viewpoint of steel producers, the structural market is at the high point since the boom days. This does not mean that there is a sudden rush in the construction field, but it does show the breadth of Government spending in as much as public money projects form the bulk of the impressive tonnage on which price protection is being asked. A bridge across the Ohio River calls for over 7000 tons, and tunnel liners at Detroit will take 6000 tons of steel. Highway bridge programs in Iowa, Missouri, and Texas call for over 2000 tons each. Bids were opened today on one of the Mississippi River dams.

Rails

Output has been pushed down several notches and thereby rolling schedules are being extended well past the middle of August. The hot steel thus released is being diverted to other channels and ingot output is not suffering as a result of lower shipments from rail mills. The accessory market is quiet except for miscellaneous lots of special track supplies which, though important, do not come out in tonnage.

Wire Products

Sellers are standing in awe before a market that has run to a summer high in which the movement of wire products is better than either the average in April or in May, and all of this without the whip of higher third quarter prices. Third quarter books are beginning to have weight, and inquiries give assurance of active interest in forward commitments. The big run of business is in the manufacturing lines, but, strange as it may seem, jobbers and distributers in country areas report exceptional summer business. Some sections of the country that have lacked sufficient rain have been relieved of the immediate drought threat. Orders for electrical wire are more satisfactory.

Bars

Specifications are brisk as users strive to take full second quarter commitments and thereby benefit by the old price. Automobile plants are still taking liberal tonnages for

current models, but there is also proof that some steel is now beginning to move for use in 1937 models. In fact, there are signs that point to the possibility of a real scramble among automobile manufacturers to introduce new models earlier than was practiced last fall. Bar mills are benefiting from railroad business, and, though agricultural implement schedules may be slightly lower, the movement of steel to those plants has not dropped. Steel producers take this to mean that schedules are soon to be pushed up again.

Sheets

All sheet mills in this area are operating at capacity and second quarter books have been closed. Automobile specifications are wavering, this being a week when releases are on the upgrade. Miscellaneous demand is heavy as mills and consumers both strive to make the most of second quarter bookings.



. . . Government to buy 18,900 tons of reinforcing bars.

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. . . Large structural projects are pending.

SAN FRANCISCO, June 23.—Contracts involving major tonnages which were added to the pending list during the past week include one for 18,900 tons of reinforcing bars for the United States Engineers. Bids will be opened tomorrow at Los Angeles. At San Francisco bids are being opened on two hangar buildings for Yerba Buena shoals, in San Francisco Bay, calling for 1500 tons of shapes and 500 tons of bars. Conduit No. 16 at Denver will involve 3610 tons of 43-in. steel pipe or an alternate of reinforced concrete in which about an equal tonnage of bars will be used. Plans for the Illinois-Pacific Glass Co. plant at Oakland are being completed and bids should be called for within 30 days.

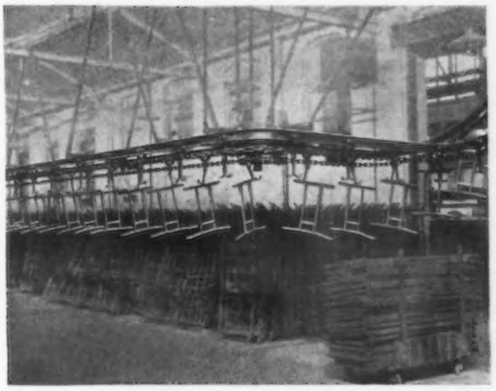
Lettings during the week, although restricted, were for fair tonnages. Soule Steel Co. will furnish 1250 tons of bars for the United States Engineers at Los Angeles and also 960 tons for the Alemany Boulevard sewer at San Francisco, a contract which has been pending for months. Bethlehem Steel Co. took 1112 tons of structural steel and 1350 tons of sheet piling on four projects.

Bids were opened at Los Angeles during the week on 13,000 tons of cast iron pipe and it is expected that the tonnage will be divided between National Cast Iron Pipe Co., American Cast Iron Pipe Co. and United States Pipe & Foundry Co. No action has been taken on the two Matson company freighters involving 4000 tons of shapes and 6000 tons of plates.

Although warehouse business generally on the Coast has been most favorable the jobbers in San Francisco are being temporarily handicapped by a local strike. Mill operations continue at near capacity, but should show a decline by the end of the quarter. Coming price increases are stimulating the placing of a real volume of smaller orders.

How to Handle Your Product MECHANICALLY—

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Link-Belt Conveyor handling glider parts from paint drying oven to packing room at Bunting Glider Company, Philadelphia. In addition to saving them a substantial sum in handling costs, they advise that this conveyor has saved about 3,000 sq. ft. of floor space, which was required when this work was done by their old method.

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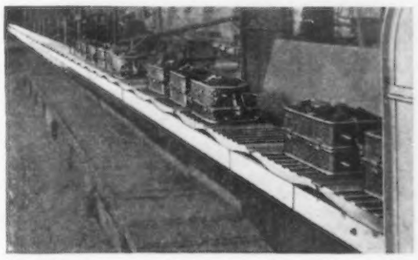
Send for General Catalog 600. Address Link-Belt Company, Chicago, Philadelphia, Indianapolis, Atlanta, San Francisco, Toronto, or any of our offices, located in principal cities. 5762



Link-Belt Overhead Conveyor moves the trucks automatically between stock rooms and shipping platform at the new warehouse of the Zellerbach Paper Company, Los Angeles. This system saves valuable floor space, since the conveyor is suspended entirely from the roof trusses



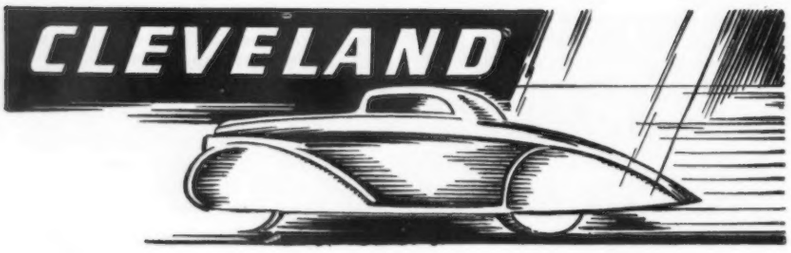
Heavy steel drums of printing ink are handled easily and efficiently on this Link-Belt conveyor, at the plant of Howard Flint Ink Company, Detroit. Conveyor operates in either direction, permitting it to handle drums to or from railroad car.





Link-Belt makes conveyors of every type for handling all materials. The illustration to left shows a Link-Belt conveyor handling molds in a foundry, and at the right, a conveyor of the belt type as used for handling loose materials. Industry can reduce costs and increase profits by using Link-Belt conveyors

LINK-BELT CONVEYORS



. . . Production rises to 79 per cent of capacity.

o o o

. . . Mills close books on second quarter business.

o o o

. . . Many consumers find that handling charges on stock material more than offset price increases.

CLEVELAND, June 23.—With a heavy backlog of orders for finished steel which mills are rushing to get out in June, ingot output in the Cleveland-Lorain district increased three points this week to 79 per cent of capacity. One additional open-hearth furnace was put on in Cleveland and one in Lorain.

Sales continue in good volume except in sheets, activity in which has subsided sharply because practically all mills can take no more orders for any grade for shipment in June. Mills also have about all the tonnage of steel bars they can roll this month and deliveries on these and sheets taken at second quarter prices will run well into July. While producers are comfortably filled with orders for other products on which price advances have been made, little if any carryover until next month will be necessary except on sheets and bars.

Buying of sheets and bars for the third quarter at the $2 a ton price advance has been started in a small way by consumers who have been unable to place additional tonnages at current prices because of the filled up conditions of the mills. No resistance to the higher prices is reported. There evidently has not been a great deal of speculative buying because many consumers are uncertain what sizes they will need and others do not feel that the $2 a ton price advance is enough incentive to stock up heavily.

There is not a great deal of activity in billets. Consumers are not buying ahead because they do not know the sizes they will require. Protection at present prices has been taken on considerable tonnage of structural shapes and other mill products for projects on which bids will be taken before June 30.

Pig Iron

Contracting for the third quarter is continuing in good volume. However, many consumers have not yet placed contracts and some of these are buying only for their early requirements, making current orders fairly numerous. Shipments so far this month show some increase over May. Demand is well diversified. Automobile foundries are taking iron in much smaller quantities than last month.

Sheets

Some business for the third quarter delivery has been taken at the $2 a ton advance in prices which buyers so far have accepted without complaint. Practically all the mills are out of the market for current orders, most of them having withdrawn several days ago when they had all the tonnage on their books that they could get out in June. However, few if any of the mills will be able to complete shipments of these orders by July 1 and some producers will not clean up their specifications for cold-rolled sheets until about July 15. Automobile manufacturers have covered to the extent of their requirements for present models at the second quarter prices but have purchased little if any material for stock, as they do not know the sizes the new models will take. Speculative buying evidently has been quite limited. Some stamping plants report that they would effect no saving by putting sheets in stock as rehandling from warehouse instead of taking material direct from

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cars or trucks to presses would entail an additional expense that would offset what they would save by stocking at present prices.

Strip Steel

The price advance has not materially stimulated sales of hot-rolled strip and some of the mills have not found it necessary to set a deadline date for taking orders for shipment at present prices. The carry-over after June 30 will be very light. Without the incentive of a price advance and not very much new business from the motor car industry, the demand for cold-rolled strip is quite light.

Bars, Plates and Shapes

The third quarter price advance is still forcing out a good volume of business in steel bars for June shipment, and a few small lot sales have been made for the third quarter of sizes producers cannot deliver this month. Demand for alloy steel bars is also being stimulated by the price advance. In the construction field two awards aggregating 425 tons of structural shapes were made during the week, and there is considerable demand for small lots of building work. A hockey rink in Cleveland will take 1200 to 1500 tons. Several grade crossing projects in Ohio that have long been pending are still being held back. A Pittsburgh district mill has taken 700 tons of plates for remodeling a Lake freighter.

PIPE LINES

Warfield Natural Gas Co., Louisa, Ky., plans new welded 8 to 16-in. steel pipe line for natural gas transmission from gas field in Martin County, Ky., to Boldman, Pike County, about 20 miles, to connect with company booster station at latter place. Work is scheduled to begin in July. Cost over $100,000.

General Purchasing Officer, Panama Canal, 1435 K Street, N.W., Washington, asks bids until July 2 for steel pipe (Schedule 3157).

Northern Natural Gas Co., City National Bank Building, Omaha, Neb., has arranged bond issue of $2,000,000, proceeds to be used for new welded steel pipe line from natural gas field at Hugoton, Kan., to connection with present trunk line near Mullinville, Kan., about 100 miles, for which general contract was let recently to Truman N. Smith Construction Co., El Dorado, Kan.; 20-in. electrically welded steel pipe will be furnished by A. O. Smith Corp.

Humble Pipe Line Co., Humble Building, Houston, Tex., an interest of Humble Oil & Refining Co., same address, plans new 6 to 8-in. welded steel pipe line from present terminus in O'Connor oil field district, Refugio County, Tex., to point near Heyser, Calhoun County, Tex., about 20 miles, for crude oil transmission. A similar line is planned from last noted place to Placedo oil field, Calhoun County, about seven miles.

Texas-Empire Pipe Line Co., Philtower Building, Tulsa, Okla., has let contract for welded steel pipe line from Sheldon, Mo., to Valley Center, Kan., about 145 miles, to Oklahoma Contracting Co., Magnolia Building, Dallas, Tex., 60 miles, and Truman N. Smith Construction Co., El Dorado, Kan., for remainder of line; also contracts to following for loops and extensions in main welded steel pipe line between Sheldon, Mo., and Virginia, Ill.; Kelly-Dempsey Co., 35 North Madison Street, Tulsa (Loop No. 1); Jones & Brooks, Inc., Insurance Building, Oklahma City (Loops Nos. 2 and 3); Williams Brothers Construction Co., Oklahoma City (Loops Nos. 4, 5, 8 and 9); Truman N. Smith Construction Co., noted (Loops Nos. 6 and 7). Pipe and fittings will be furnished by Texas-Empire Company, which recently placed awards with Republic Steel Corp., and A. O. Smith Corp., for 21,000 tons and 20,000 tons, respectively. Entire project will cost over $4,000,000.

Anderson-Pritchard Oil Co., Ramsey Building, Oklahoma City, has approved plans for about 9600 ft. of 6-in. welded steel pipe line in Thirty-sixth Street for oil transmission. E. H. Wahl, address noted, is consulting engineer.

Potter Pipe Line Co., Corpus Christi, Tex., plans 6-in. welded steel pipe line from Corpus Christi to Clarkwood, about eight miles. An extension from latter point to oil field in Duval County, abut 60 miles, will be made later.



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WASHFOUNTAINS AND SHOWERS



. . . Finished steel is still being booked at second quarter prices.

o o o

. . . Products not affected by price advance are also in good demand.

o o o

. . . Heavy tin plate specifications may continue for two months.

NEW YORK, June 23.—With only a week remaining in the second quarter, most mills are still booking tonnage at current prices, which cannot possibly be shipped until July is well advanced. A few companies have closed their books on certain finishes of sheets, but bids are still being taken on bars, plates and shapes for identified projects, and few companies who have tonnage of any sort to place are experiencing difficulty. In all cases, mills are taking such business for shipment at their convenience.

Despite the heavy volume of business in products on which prices are being advanced July 1, demand for tin plate, tubular goods and wire products, on which current quotations are being extended, remains good. Tin plate in particular is probably the most active product in this district and sellers believe business will keep up well into August. Standard pipe has been improving steadily for several weeks, reflecting the increased activity in small building projects in the Metropolitan district.

Contrary to a report mentioned last week, tin mill black plate prices will not be advanced for the third quarter. Terne plate also remains the same, although long ternes will be $2 a ton higher. On tie plates, track bolts and track spikes, one large maker will take business from the railroads at current prices until Aug. 31, for shipment until Sept. 30. Another had announced a deadline of July 31 for the acceptance of business at present prices.

Railroad activity is featured by an inquiry for 20,000 tons of rails from the Norfolk & Western, which has also asked for bids on its routine quarterly steel requirements. This road is in the market for 1000 freight cars. The New Orleans, Texas & Mexico, a Missouri-Pacific subsidiary, is inquiring for 200 box cars.

The Navy Department is buying heavy tonnages of steel, and its Bureau of Supplies and Accounts will take bids in Washington, July 3, on 1641 tons of bars for various Navy yards.

Pig Iron

A broadening market for iron is indicated by the fact that, while sales are still confined to small lots, they are more numerous. In the past week practically all sellers reported a better aggregate volume of business, though there were occasional exceptions. Opinion on all sides is that the market is developing in line with consumer tendencies to place third-quarter contracts a bit more freely. In addition, spot buying for June shipment continues. Inquiry is not large at the moment, though about 1500 tons is active on a single order, including both foundry and malleable grades.

Reinforcing Steel

With the open publication of reaffirmed prices, the reinforcing market is expected to become steadier. The unfailing rumors of heavy cutting which have been prevalent for the past few months should at last be conclusively proven true or untrue, since the penalties attached to price cutting when the prices have been publicly announced are such as to cause sellers to avoid them by sticking closely to the base figures. Concrete Steel Co. has been awarded 350 tons this week for work on the West Side elevated highway from 94th to 98th Streets. A small job of about 75 tons in Middletown, N. Y., was given to the Capitol Steel Corp. through the Westchester office of the Treasury Procurement Division. The outstanding pending work is a warehouse in Washington, which will require 1500 tons of bars. Bids were taken Friday, but no decision has yet been announced. Cauldwell-Wingate Co., New York, was low bidder on the housing project in Harlem which will take about 800 tons of reinforcing bars, but announcement of the steel award is awaiting the signing of the contract.



. . . Birmingham to buy 10,000 tons of cast iron pipe.

o o o

. . . Steel output is curtailed.

BIRMINGHAM, June 23. — The City of Birmingham will open bids July 7 on approximately 10,000 tons of 60-in. pipe, which is the remaining portion required for the industrial water system. Specifications call for approximately 86,000 linear ft., at an expected cost of about $900,000. This tonnage will be financed by a PWA loan. This will be the second order for pipe. On April 10, the WPA took bids on approximately 12,000 tons, which was awarded to Ingalls Iron Works and Chicago Bridge & Iron Works. Deliveries are now underway on this tonnage. The industrial water system is being financed jointly by a WPA allotment and a PWA loan, and will cost about $5,600,000.

On July 21 bids will be opened in Washington by the housing division of the Federal Emergency Administration of Public Works for the construction of the superstructures of Smithfield Court low cost negro housing project in Birmingham. This project is to cost more than $2,000,000.

The first changes in iron and steel production since the early

part of the year are now taking place. On Saturday, the Tennessee Coal, Iron & Railroad Co. blew out its Ensley No. 5 furnace, which was on basic iron. Two Fairfield open hearths were also closed down over the week-end. These reductions were preparatory to the shutdown of the Ensley rail mill on June 24. Another Ensley blast furnace is scheduled to be blown out about July 1. It is expected that the three Ensley open hearths and two other blast furnaces will continue for an indefinite period. Eleven blast furnaces and 13 open hearths are now operating. Gulf States Steel Co. is continuing its four open hearth units, and the Tennessee company has six pouring at Fairfield and three at Ensley.

Bookings last week of bars, plates and shapes were substantial. Current volume of new tonnage is holding up in a satisfactory manner.

Pig iron buying has been only fair, as there is no price incentive. Current prices, with a $15.50 base, have been extended to the next quarter.

The Bessemer, Ala., plant of the Pullman-Standard Car Mfg. Co. will resume operations this week on an order for 100 phosphate cars for the Seaboard Air Line.

CINCINNATI

. . . Sheet production at 100 per cent of capacity.

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. . . Backlogs are heavy.

CINCINNATI, June 23.—Price advances on finished sheets have not affected consumers' interest in this area. Bookings for third quarter are steadily good and on a higher level than last year. In fact, mill interests see no indication of the customary summer lull in early July business. Speculation is almost nil, current bookings being for fabricators' requirements. Because of heavy June ordering, mills will carry over a backlog of about 10 days into July, which, combined with present third quarter business, brings backlogs to about two weeks' operations. Demand is widely scattered, with automotive sources steadily active for new model fabrication. Rolling schedules are at 100 per cent this week, with the possibility of continuance well into next month.

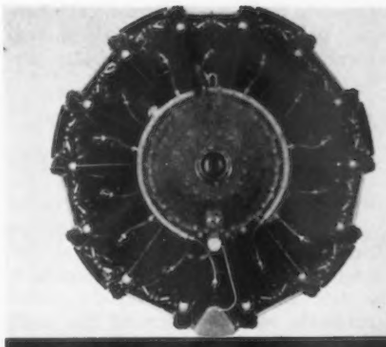
Steel fabricators' interest centers on a new Federal building in Cincinnati. Bids for the preliminary work are to be taken July 21, but the extent of steel requirements is vague.

Warehouse business is better than in the past month, as construction demand expands. Prices, in keeping with recent mill advances, are to be raised July 1, but announcement of schedules is being withheld until the latter part of this week.

Pig iron buying is unspectacular. Ordering in small lots is steadily good, but anticipatory buying is absent. Foundry operations are unchanged from last week when a slight moderation in the melt was reported.

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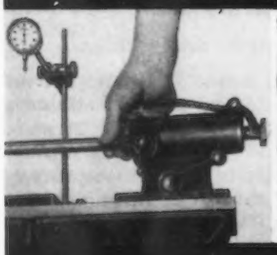
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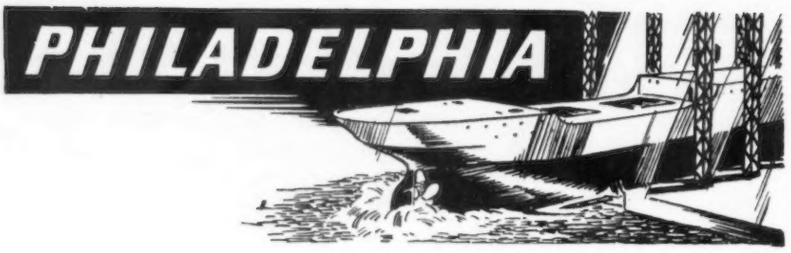


SET UP AND INSPECTION TOOLS



MARTELL REAMERS

2671



. . . District rate unchanged at 46 per cent.

o o o

. . . Some mills refuse low-priced orders; others continue to accept second quarter business.

o o o

. . . Backlogs guarantee an active July.

PHILADELPHIA, June 23. — Open-hearth activity has changed little during the past seven-day period; consequently the average district rate is maintained at 46 per cent of capacity. Practically every producer has about cleaned out his ingot yard, and there is no re-stocking at the present time. This would indicate that present activity will continue for at least another month. Whereas a summer slump had previously been anticipated, many producers are now hoping for an early appearance of fall requirements to take up the slack as current backlogs are depleted.

Consumers are still able to secure practically every type of product at second quarter price levels, although several of the larger Mid-Western producers insist that Saturday was the deadline on this type of sheet and strip business. However, whether the deadline was last Saturday or will be June 30 is of little consequence, inasmuch as rolling orders now on hand cover district requirements well into August.

All sellers are expecting a July-August period practically devoid of new business. Buyers will be assimilating deliveries and will delay re-ordering until the last moment. But by early September, automobile demands and general fall pick-up should serve to re-establish mill activity at least to current levels.

Pig Iron

Current shipments are, on the average, running well ahead of last month. Aggregate foundry melt has shown no tendency to ease off; consequently there is quite a constant demand for iron here. This demand, however, is spread pretty thin among a number of sellers, and it is made up of many small orders for quick shipment. Even though western furnaces continue to build up sentiment for better prices in the fourth quarter, local sellers still show little enthusiasm for such a move.

Sheets and Strip

Several mills are refusing additional second-quarter business, although large buyers are still able to place such orders in other directions. Speculative buying has not been excessive here. However, the district is generally covered against probable requirements of the next six weeks. New bookings are expected to be very scarce during the next two months, but the outlook for the year's end is considered very encouraging.

Warehouse Business

June orders are about on a par with those in May, and aggregate second quarter bookings will undoubtedly average considerably better than the total for the first quarter. Galvanized sheets and formed roofing are in particular demand, although all stock items are moderately active. Warehouses have entered anticipatory orders in moderate volume in order to lessen the effect of mill price advances, and they in turn look for no change in their price lists for from one to two months.

Bars, Shapes and Plates

Building demand is quite active, both private and public, but much of this work is too small to warrant individual listing. The outlook for fabrication is so encouraging as to cause one large concern to re-open its Philadelphia shop after several years of idleness. The only large bar award of the week was a road project in Lycoming County, Pa., consisting of 200 tons, which was awarded to Bethlehem Steel Co. This same firm secured 1050 tons of shapes for a Carpenter Steel Co. building, and 160 tons for an industrial building at Stroudsburg, Pa. New projects include bridges in Berks and Jefferson Counties, Pa., and a 400-ton building at Pottstown, Pa. Plate bookings are confined mostly to small lots. Quite a volume of Navy tonnage will soon be distributed, and, in addition, a local yard has a good chance to bid in several destroyers on Aug. 15. Also, local yards are again figuring on the United States Lines cabin boat, which will require about 16,000 tons of plates.

Imports

The following iron and steel imports were received here last week: 7447 tons of chrome ore from French Oceania; 989 tons of pig iron and 101 tons of ferromanganese from the Netherlands; 202 tons steel bars, 66 tons of steel bands, 87 tons of structural shapes and 7 tons of steel floor plates from Belgium; 35 tons of zirconium ore and 5 tons of titanium ore from Brazil; 70 tons of ferromanganese from Norway; 41 tons of pig iron from Norway; 50 tons of beryllium ore from Argentina, and 43 tons of structural shapes from France.



. . . Highway projects and dam call for 12,000 tons of steel.

o o o

. . . Demand for all products continues brisk.

ST. LOUIS, June 23.—Bids will be opened this week for highway projects and a dam involving more than 12,000 tons of structural steel and 1000 tons of reinforcing bars, in which St. Louis interests will submit proposals. The largest of these projects is a highway bridge across the Mississippi at Cairo, Ill., requiring 7000 tons of shapes, bids for which are due today, and the following highway bridges, for which bids are due June 25: State of Missouri, 2000 tons of shapes; State of Kansas, 1500 to 2000 tons of shapes; and Kings Highway Viaduct, 550 tons of shapes, structurals and 500 tons of reinforcing bars, and Wabash grade separation, 230 tons of re-

inforcing bars. The two latter are in St. Louis. The dam, in the Mississippi River at Clarkton, Mo., requires 1000 tons of structural steel and 350 tons of reinforcing bars. Bids are due tomorrow.

The New Orleans, Texas & Mexico, Missouri Pacific subsidiary, will buy 200 40-ton box cars at an estimated cost of $500,000.

Buying of finished iron and steel continues brisk on virtually every item except roofing and wire products, on which slackening is due to the time of farmers' being required in the field and to the postponing of repair work. Bale ties are more active. Most of the buying has been to cover orders on hand, but there have been some speculative orders placed. While mills set last Saturday as the deadline for specifications for flat sheets, roofing specifications will be accepted until June 30, at old prices.

Sales of pig iron have been fairly active during the last week, and shipments are being well maintained. It is believed that most melters have covered for their requirements for the third quarter, although some still are holding back, content to buy material as needed. While the agricultural implement business as a whole is slackening, the tractor division is reported to be as busy as ever, working day and night shifts.

The plant of the Bettendorf Co., Bettendorf, Iowa, manufacturer of freight cars, has reopened after having been closed down for five years. One open-hearth furnace of a total of six is in operation.

BOSTON

. . . Pig iron buying less active.

o o o

. . . Steel output is maintained.

BOSTON, June 23.—The pig iron buying movement has dried up, sales the past week having fallen to around 1000 tons. It now develops that machine tool builders, more particularly those in Connecticut, who accepted Russian orders for equipment have taken iron from that country as part payment and consequently are out of the market at the moment. However, they will require iron later and signify their intentions of buying domestic brands.

The Phillipsdale, R. I., steel mill and the American Tube and Stamping Co., Bridgeport, are each operating three furnaces. Tapering off of business around July 1 is anticipated by some steel and allied plants, but industry collectively is confident that summer operations will exceed last year's, and that the fall will be the busiest in several years.

The fabricated structural steel business is picking up, and reinforcing steel bars are improving, although the bulk of passing business in the latter is in small lots. Orders for carlots of cast iron pipe for prompt delivery are very good, and some round-lot business is in the making.

SHAFTING

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TIME is an accurate gauge that measures the calibre of a company and its products.

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- Alloy Steels

BLISS & LAUGHLIN, INC.

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GREAT BRITAIN

. . . British steel future still uncertain.

o o o

. . . Demand may exceed production.

o o o

. . . Finished steel movement heavy.

LONDON, June 22 (*By Cable*). —The British iron and steel market is firm in all sections but transactions are limited by a shortage of the most needed materials. Overseas buying is improving.

Pig iron is less scarce though new business is still unwelcome. The future is uncertain as demand is likely to expand faster than production. An advance of 5s. in foundry iron is probable this week. Domestic output of semi-finished steel is still inadequate but makers are less hard pressed owing to the increased use of Continental material.

A heavy demand for finished steel for ship building, building, and for railway purposes is reported. Numerous orders have been placed for new ships and an order for a Queen Mary sister ship is imminent.

Negotiations are practically concluded for an International coke cartel regulating prices and export quantities comprising England, Germany, Holland, Belgium and Poland.

Bookings of tin plates for home and export are better. Operations are at about 60 per cent of capacity but a recession may set in due to the sudden hot weather. Continental iron and steel is very quiet. Belgian steel workers are striking but the Antwerp dock strike is terminated and shipments have been resumed. French heavy industry is again working more normally despite trouble in the Lorraine coal fields. Belgian and French industry is fearful of the future as owing to workers' demands, higher production costs are inevitable and exports as likely to suffer.

Japan has been tentatively approached regarding membership in the International steel cartel.

The United Kingdom May exports of pig iron were 7900 tons of which 1000 was shipped to the United States. Total exports of iron and steel are 204,000 tons.

RAILROAD BUYING

Southern Pacific has ordered 500 automobile cars from General American Car Corp., 250 automobile cars from Mount Vernon Car Co., 500 box cars from Bethlehem Steel Co., 500 box cars from Pressed Steel Car Co., 500 box cars from Pullman-Standard Car Mfg. Co., 250 box cars from American Car & Foundry Co., 20 express horse cars from St. Louis Car Co., and will build 300 freight cars in its own shops.

Union Pacific has ordered 1000 underframes from Ryan Car Co.

Wheeling & Lake Erie has placed 1000 freight cars.

Northern Pacific has placed 500 gondola cars with Pressed Steel Car Co., and will build 200 flat cars in its own shops.

Green Bay & Western is inquiring for three locomotives of 2-8-2 type.

Norfolk & Western is asking for 1000 box cars.

DuPont Co. is inquiring for one to five 70-ton tank cars.

Standard Oil Co. of New Jersey has ordered six tank cars from Pullman Standard Export Corp. for use in Brazil.

Baltimore & Ohio has ordered 50 air conditioning units from York Ice Machinery Corp.

St. Louis-Southwestern Railroad's application to spend $1,933,203 for new equipment has been taken under advisement by Federal Judge Davis of St. Louis following objections from creditors.

Trustee of New Orleans, Texas & Mexica, subsidiary of Missouri Pacific, has been authorized to purchase 200 40-ton box cars at cost of $500,000.

Public Service Co., St. Louis, will purchase 40 buses of 30 and 37 passenger type, to cost between $9,000 and $10,000 each.

RAILS AND TRACK SUPPLIES

Norfolk & Western is inquiring for 20,000 tons rails.

In a new booklet on "Railway Track Grinding," by the Norton Co., Worcester, welding processes and methods of grinding are outlined, and grinding wheel recommendations are given.

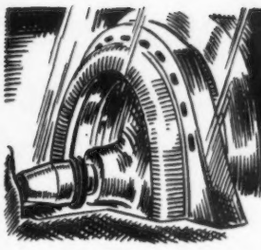


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NON-FERROUS

. . . Zinc prices reduced $1 a ton under pressure to sell.

o o o

. . . Lead stocks up 8400 tons during May.

o o o

. . . Copper quiet, but tin market strengthens as sellers take more hopeful attitude.

NEW YORK, June 23.—Domestic copper sources report a continued quiet demand for this product. About 1000 tons was disposed of yesterday, a total somewhat larger than the recent daily average. Total sales for the month through yesterday were approximately 12,039 tons. Buying is still said to be confined to company-owned fabricators. Consumption, as indicated by shipments, is holding up well. The price is holding at 9.50c. On export business prices are stronger, the range at present being about 9.10c. to 9.17½c. a lb.

Tin

The market in New York continued rather quiet and unsettled during most of last week, but on Friday it toned up and attracted some buying, particularly in futures. A growing interest in spot positions indicated that these supplies are tight. As trading has picked up, prices have improved, and today's spot quotation for Straits metal at New York is 42.62½c. a lb., contrasting with a low of 41.10c. Friday. A factor in the recent situation has been a reluctance on the part of sellers to offer freely, pending the meeting of the International Tin Committee on June 25. In general, pessimism over the international outlook is less pronounced than a week ago, and this has been reflected by a better price for tin abroad. The morning's London quotation for standard spot metal was £184 15s., while futures were £181 5s. The Eastern price was £184 10s.

Lead

May statistics showed a rise in production of 3478 tons to 41,551 tons, while shipments declined 7332 tons to 33,125 tons. As a consequence, stocks rose 8418 tons to a total of 229,409 tons at the month's close. The large gain in stocks was disappointing, but it is said that these supplies are in safe hands where they will not be allowed to influence the course of the market materially. Demand for lead is currently rather light, and sales are not running much above 2000 to 3000 tons weekly. Failure of consumers to contract for July needs is blamed for the current condition, but is expected to have an offsetting influence shortly. Lead continues quotable in all directions at 4.60c. a lb., New York, with the price firm as heretofore.

Zinc

The price has declined to 4.85c. a lb., East St. Louis. Reaction to the prior level of 4.90c. began early last week, if not sooner, but the conflict showed no definite signs of resulting in a wholesale reduction until toward the week's close. Sales on Thursday and Friday were made freely at the lower figure, though not until Saturday, at least, were all producers competing on the same basis. London quotations influenced the situation by ebbing to as low as approximately 3c. a lb. at one point last week, though since then they have tended higher. Turnover in Prime Western for the week amounted to 5416 tons, most of which was marketed at the 4.90c. level. Shipments were 4624 tons.

The Week's Prices. Cents Per Pound for Early Delivery

	June 17	June 18	June 19	June 20	June 22	June 23
Electrolytic copper, Conn.*	9.50	9.50	9.50	9.50	9.50	9.50
Lake copper, N. Y.	9.62½	9.62½	9.62½	9.62½	9.62½	9.62½
Straits tin, Spot, New York	41.37½	41.10	41.50	....	41.87½	42.62½
Zinc, East St. Louis	4.90	4.90	4.90	4.85	4.85	4.85
Zinc, New York†	5.27½	5.27½	5.27½	5.27½	5.22½	5.22½
Lead, St. Louis	4.45	4.45	4.45	4.45	4.45	4.45
Lead, New York	4.60	4.60	4.60	4.60	4.60	4.60

*Delivered Connecticut Valley; price ¼c. lower delivered in New York.
†Includes emergency freight charge.

Aluminum, virgin 99 per cent plus, 19.00c.-21.00c. a lb., delivered.
Aluminum, No. 12 remelt No. 2 standard, in carloads, 17.00c. lb., delivered.
Nickel, electrolytic, 35c. to 36c. a lb. base refinery, in lots of 2 tons or more.
Antimony, Asiatic, 13.00c. a lb., New York.
Quicksilver, $74.50 to $75.50 per flask of 76 lb.
Brass ingots, commercial 85-5-5-5, 9.25c. a lb., delivered; in Middle West ¼c. a lb. is added on orders for less than 40,000 lb.

From New York Warehouse

Delivered Prices, Base per Lb.

Tin, Straits pig	44.00c. to 45.00c.
Tin, bar	46.00c. to 47.00c.
Copper, Lake	10.25c. to 11.25c.
Copper, electrolytic	10.25c. to 11.25c.
Copper, castings	10.00c. to 11.00c.
*Copper sheets, hot-rolled	17.00c.
*High brass sheets	15.12½c.
*Seamless brass tubes	17.37½c.
*Seamless copper tubes	17.50c.
*Brass rods	13.12½c.
Zinc, slabs	5.75c. to 6.75c.
Zinc, sheets (No. 9), casks, 1200 lb. and over	10.25c.
Lead, American pig	5.10c. to 6.10c.
Lead, bar	6.10c. to 7.10c.
Lead, Sheets, cut	8.25c.
Antimony, Asiatic	14.00c. to 15.00c.
Alum., virgin, 99 per cent plus	23.30c.
Alum., No. 1 for remelting, 98 to 99 per cent	18.50c. to 20.00c.
Solder, ½ and ½	28.50c. to 29.50c.
Babbitt metal, commercial grades	25.00c. to 60.00c.

*These prices are also for delivery from Chicago and Cleveland warehouses.

From Cleveland Warehouse

Delivered Prices Per Lb.

Tin, Straits pig	46.00c.
Tin, bar	48.00c.
Copper, Lake	10.25c. to 10.50c.
Copper, electrolytic	10.25c. to 10.50c.
Copper, castings	10.00c. to 10.25c.
Zinc, slabs	6.50c. to 6.75c.
Lead, American pig	5.20c. to 6.50c.
Lead, bar	8.50c.
Antimony, Asiatic	15.00c.
Babbitt metal, medium grade	19.00c.
Babbitt metal, high grade	50.00c.
Solder, ½ and ½	25.00c.

Old Metals, Per Lb., New York

Buying prices are paid by dealers for miscellaneous lots from smaller accumulators, and selling prices are those charged to consumers after the metal has been prepared for their uses. (All prices are nominal.)

	Dealers' Buying Prices	Dealers' Selling Prices
Copper, hvy. crucible	7.37½c.	8.12½c.
Copper, hvy. and wire	7.25	7.75c.
Copper, light and bottoms	6.25c.	6.75c.
Brass, heavy	4.12½c.	4.75c.
Brass, light	3.37½c.	4.12½c.
Hvy. machine composition	6.12½c.	6.62½c.
No. 1 yel. brass turnings	5.12½c.	5.62½c.
No. 1 red brass or compos. turnings	5.75c.	6.25c.
Lead, heavy	3.62½c.	4.00c.
Sheet aluminum	12.75c.	14.25c.
Zinc	2.50c.	2.87½c.
Cast aluminum	12.12½c.	13.25c.



. . . Lettings decline to 16,140 tons from 25,410 tons last week.

o o o

. . . New projects in large volume at 30,500 tons, as against 18,455 tons in the previous week.

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. . . Plate awards total 7255 tons.

NORTH ATLANTIC STATES

Edmunds, Me., 100 tons, bridge, to Lackawanna Steel Construction Corp., Buffalo.

Swanton, Vt., 280 tons, bridge, to Bethlehem Steel Co.

Central Vermont Railroad, 600 tons, bridge No. 95 over Connecticut River, to American Bridge Co.

Amherst, Mass., 150 tons, bridge, to New England Structural Co., Everett, Mass.

Bristol, R. I., 125 tons, boat storage shed, to International Steel & Iron Co.

Cranston, R. I., 160 tons, hospital building, to J. H. Tower Iron Works, Providence, R. I.

Rouses Point, N. Y., 1250 tons, bridge, to Bethlehem Steel Co.

Niagara Falls, N. Y., 425 tons, extension to Union Carbide Co. building, to American Bridge Co.

Buffalo, 220 tons, warehouse for McKesson & Robbins, to Ernst Iron Works, Inc., Buffalo.

Rochester, N. Y., 200 tons, extension to power house, Rochester Gas & Electric Corp., to Genesee Bridge Co., Rochester.

Schenectady, N. Y., 360 tons, State highway bridge, to Phoenix Bridge Co., Phoenixville, Pa.

Jersey City, 1125 tons, recreation center, to American Bridge Co.

Jersey City, 270 tons, stadium, to Oltmer Iron Works, Jersey City.

Philadelphia, 190 tons, garage for Penn Mutual Life Insurance Co., to Belmont Iron Works, Philadelphia.

Reading, Pa., 1050 tons, building for Carpenter Steel Co., to Bethlehem Steel Co.

Stroudsburg, Pa., 160 tons, Line Materials Co. building, to Bethlehem Contracting Co., Bethlehem, Pa.; structural purchased from Bethlehem Steel Co.

Wilmington, Del., 170 tons, Friends school building, to Bethlehem Fabricators, Inc., Bethlehem, Pa.

State of Maryland, 340 tons, lookout towers, Department of Agriculture, to Aermotor Co., Chicago.

SOUTH AND SOUTHWEST

Fort Worth, Tex., 1015 tons, bridge, to North Texas Iron & Steel Co.

Lee County, Tex., 150 tons, bridge, to Austin Brothers, Dallas, Tex.

Tyler, Tex., 1025 tons, to North Texas Iron & Steel Co.

Bastrop County, Tex., 180 tons, bridge, to North Texas Iron & Steel Co.

Alva, Okla., 700 tons, bridge, to J. B. Klein Iron & Foundry Co., Oklahoma City.

Okmulgee, Okla., 800 tons, underpass, to Capital Steel & Iron Co., Oklahoma City.

Mesa, Ariz., 105 tons, State bridge over Boulder Creek, to Allison Steel Mfg. Co., Phoenix, Ariz.; previously reported to Virginia Bridge Co.

CENTRAL STATES

Detroit, 345 tons, addition to factory building, to Whitehead & Kales Co., Detroit.

Delta, Ohio, 225 tons, highway bridge, to Bethlehem Steel Co.

Warren, Ohio, 200 tons, addition for Packard Electric Co., to Truscon Steel Co., Youngstown.

Lake County, Ind., 225 tons, bridge, to American Bridge Co.

South Bend, Ind., 190 tons, building for Notre Dame College, to Mississippi Valley Structural Steel Co., St. Louis.

Sibley County, Minn., 140 tons, bridge, to Lakeside Bridge & Steel Co., Milwaukee.

Hennepin County, Minn., 265 tons, bridge, to American Bridge Co.

Albert Lea, Minn., 440 tons, packing plant, to Iowa Steel & Iron Co., Cedar Rapids, Iowa.

WESTERN STATES

Climax, Colo., 750 tons, crusher plant, to Kansas City Structural Steel Co., Kansas City, Mo.

Los Angeles, 525 tons, building for California Institute of Technology, to Consolidated Steel Corp., Los Angeles.

Southern Pacific and Western Pacific Railroads, 675 tons, bridge at Niles, Cal., to Moore Dry Dock Co., San Francisco.

San Francisco, 140 tons, apartment house on Jackson and Laguna Avenues, to Bethlehem Steel Co.

Sausalito, Cal., 500 tons, tunnel supports on road to Golden Gate bridge, to Bethlehem Steel Co.

Sacramento, Cal., 472 tons, State overhead crossing at Jibboom Street, to Bethlehem Steel Co.

NEW STRUCTURAL STEEL PROJECTS

NORTH ATLANTIC STATES

Philadelphia, 3500 tons, Dobbins school.

State of Pennsylvania, 295 tons, highway bridges.

Pottstown, Pa., 400 tons, building for Doehler Die Casting Co.; bids June 25.

Berks County, Pa., 160 tons, highway bridge; bids July 3.

Jefferson County, Pa., 620 tons, highway bridge; bids July 3.

Washington, 300 tons, viaduct in Franklin Street, N.E.

SOUTH AND SOUTHWEST

Guntersville, Ala., 340 tons, lock gates for TVA.

Albuquerque, N. M., 708 tons, two State grade separations; bids June 26.

Fort Worth, Tex., 600 tons, State hospital.

CENTRAL STATES

Cleveland, 1100 tons, Republic Steel Corp., blast furnace.

Cleveland, 1200 tons, hockey rink; bids June 26.

Cleveland, 200 tons, Westerly sewage treatment works.

Columbus, Ohio, 750 tons, bridge.

Detroit, 300 tons, addition to the Briggs Mfg. Co. plant.

Battle Creek, Mich., 500 tons, Consumer Co. power house.

Des Moines, Iowa, 2300 tons, viaduct.

State of Iowa, 2900 tons, highway bridges.

Cairo, Ill., 7200 tons, highway bridge across Ohio River.

State of Missouri, 2000 tons, highway bridges; bids June 25.

St. Louis, 550 tons, Kingshighway viaduct; bids June 25.

State of Kansas, 1500 to 2000 tons, highway bridges; bids June 25.

Manhattan, Kan., 1125 tons, bridge.

WESTERN STATES

State of Colorado, 280 tons, highway bridge.

San Francisco, 1500 tons, two hangar buildings on Yerba Buena shoals; bids opened June 24.

Portland, Ore., 163 tons, State bridge at Milwaukee Avenue; bids June 26.

FABRICATED PLATES

AWARDS

Barnstable, Mass., 100 tons, water tank, to Chicago Bridge & Iron Works, Chicago.

Portland, Me., 590 tons, Tide Water Oil Co. tanks, to Bethlehem Steel Co.

Delawanna and Bayway, N. J., 355 tons, seven tanks, Solar Fuel Oil Co., to Chicago Bridge & Iron Works.

Superintendent of Lighthouses, 315 tons, 88 buoys, to Union Boiler & Mfg. Co., Lebanon, Pa.

Houston, Tex., 4325 tons, 11 oil tanks, Shell Petroleum Corp., to Chicago Bridge & Iron Works.

Oshkosh, Wis., 350 tons, 750,000-gal. elevated water storage tank, to Pittsburgh-Des Moines Steel Co., Pittsburgh.

Green Bay, Wis., 1200 tons, oil storage tanks, to Graver Tank & Mfg. Corp.

NEW PROJECTS

Detroit, 6000 tons, tunnel liners.

Chicago, 650 tons, ladles for Inland Steel Co.

Lehigh, N. D., 1000 tons, tanks and supports.

Denver, 3610 tons, 43-in. welded pipe for conduit No. 16, alternates on reinforced concrete; bids June 30.

SHEET PILING

AWARDS

Colorado Springs, Colo., 1100 tons, facing for city dam, to American Bridge Co.

Hawaii, T. H., 1350 tons, Nuuano Stream dam, to Bethlehem Steel Co.

Anglesea, N. J., 126 tons, bulkhead at Hereford Inlet Station, United States Coast Guard, to Jones & Laughlin Steel Corp.

Jacksonville, Fla., 500 tons, to Inland Steel Co.

NEW PROJECTS

Marblehead, Ohio, 300 tons for United States Coast Guard; bids July 17.

Quincy, Ill., 5000 tons, dam across Mississippi River.

CAST IRON PIPE

Natick, Mass., has awarded 225 tons of 6 to 12-in. to Warren Foundry & Pipe Corp.

Sullivan, Me., has been granted $38,181 by Government to build a water system.

Brookline, Mass., has awarded 130 tons of 4 to 16-in. to Warren Foundry & Pipe Corp.

Department of Public Works, Bureau of Water, City Hall Annex, Philadelphia, asks bids until June 29 for pipe for water system at Mount Pleasant and Williams Avenues. Martin J. McLaughlin is director.

Cicero, Ill., has awarded 6000 tons of various sizes to United States Pipe & Foundry Co.

Landis, N. C., plans pipe lines for water system and other waterworks installation. Fund of $173,300 is being arranged through Federal aid for this and sewage system installation.

West Virginia Water Service Co., Winfield, W. Va., plans 24-in. pipe line across Kanawha Rivr at foot of Clendenin Street for main trunk line.

Daingerfield, Tex., plans pipe lines for water system and other waterworks installation. Fund of $60,000 has been approved for this and sewage system.

Dawson, Tex., closes bids July 1 for pipe for water system and other waterworks installation, Hawley, Freese & Nichols, Capps Building, Fort Worth, Tex., are consulting engineers.

Port St. Joe, Fla., plans pipe lines for water system and other waterworks installation. New sewage system also is planned. Financing will be arranged soon.

Blanding, Utah, plans pipe lines for water system, replacing present wood pipe for main trunk lines and distributing branches.

La Veta, Colo., plans main pipe line from water source on Cucharas River to municipal reservoir. Cost about $28,000. Financing will be arranged through Federal aid.

Walnut Creek, Cal., is arranging early election to approve bond issue for pipe lines for water system, including 300,000-gal. elevated steel tank, pumping machinery and auxiliary equipment. Cost about $82,000, part of fund to be secured through Federal aid. George Oliver is city engineer.

California-Oregon Power Co., Medford, Ore., plans pipe lines for extensions in water system at Klamath Falls, Ore. H. P. Bosworth, Jr., is division manager at last noted place.

Glendale, Cal., will open bids June 25 on 472 tons of 6, 8 and 12-in., class 250.

Blythe, Cal., plans pipe lines for extensions and replacements in water system. Cost about $22,000. Financing has been arranged through Federal aid.

Pendleton, Ore., plans four to five miles of 4 and 8-in. for water system extensions. Pipe will be purchased by municipality and work handled by day labor. D. D. Phelps is city water superintendent.

General Purchasing Officer, Panama Canal, 1435 K Street, N.W., Washington, asks bids until June 30 for 10,800 ft. of 2 and 4-in. and quantity of fittings (Schedule 3156).

Galena Park, Tex., plans pipe lines for water system. Fund of $60,000 is being arranged for this and new reservoir, with auxiliary waterworks installation. Garrett Engineering Co., Houston, Tex., is consulting engineer.

Charlotte, N. C., plans pipe lines for water system, including new line from Catawbe River for auxiliary supply; also one or more elevated steel tanks, new pumping machinery and accessories, and other waterworks installation. J. B. Marshall is city manager in charge.

Milwaukee has placed 1005 tons of pipe and 68 tons of special castings with United States Pipe & Foundry Co.

Random Lake, Wis., has low bid from American Cast Iron Pipe Co. for 200 tons of 6 and 8-in. pipe for new waterworks system.

Chicago has ordered 1000 tons from Glamorgan Pipe & Foundry Co. and still has a tonnage to take on which Glamorgan and United States Pipe & Foundry Co. are low bidders.

Thayer, Mo., has awarded contract for a municipal electric light plant and distribution system to Fairbanks, Morse & Co. at $65,031, subject to approval of PWA.

Lewistown, Mont., plans about six and one-half miles of 20-in. for main water line and smaller pipe for distributing system. Financing is being concluded through Federal aid. Joseph M. Schmit is city engineer.

Portland, Ore., has placed contracts for 303 tons with R. D. Wood & Co. and 192 tons with United States Pipe & Foundry Co.

Santa Barbara, Cal., will purchase 227 tons of 8-in. in open market.

Standard Oil Co. of Ohio will add a 12,000-bbl. distilling and cracking unit to its Toledo, Ohio, refinery.

Wisconsin Steel Buys Rolling Mill Equipment

INTERNATIONAL HARVESTER CO., Chicago, has placed substantial contracts with United Engineering & Foundry Co. for rolling mill machinery for its Wisconsin Steel works, South Chicago, in a modernization program involving several million dollars.

United Engineering will furnish a blooming mill and a six-stand billet mill. Production of the equipment will be started immediately and will be completed in the fall. The equipment will embody a number of innovations in conformity with advanced practices in steel rolling that are now beginning to be applied to mills other than continuous strip mills which have occupied the spotlight in the mill equipment field for the past several years.

Aluminum Association Meets in Chicago

THE summer session of the Aluminum Association and first meeting in the Middle West closed last week in Chicago, after a record-breaking attendance. Leaders of the industry, headed by Arthur V. Davis, chairman Aluminum Co. of America, and president of the association, came from the East, and nearly every company in the industry was represented by its chief executive.

The resignation of the Eastern vice-president, W. Y. C. Hunt, who had just retired from active business duties, was accepted and R. G. McKay, Reynolds Metal Co., New York, was elected Eastern vice-president.

Willard E. Hotchkiss, president, Armour Institute of Technology, outlined the efforts of the universities to give an engineering education which would fit their graduates better for industry.

In his address, "The Days of Aluminum—Old and New," Arthur V. Davis traced by interesting incidents the growth of the aluminum industry during the 50-year period from the discovery of Charles Martin Hall of an electrolytic process of producing aluminum down to the aluminum trains of today which are setting up new records between Chicago and the Pacific Coast. Mr. Davis prophesied that developments of the next 50 years would far outstrip the spectacular rise of aluminum from a chemical novelty to a fundamental factor in the lives of every citizen.



. . . Composite is unchanged at $12.75 a gross ton.

o o o

. . . Heavy orders placed at Youngstown and Buffalo.

o o o

. . . Prices on important grades show signs of advancing fractionally.

JUNE 23.—With steel operations all over the country at an unseasonably high level, scrap brokers are building up an optimistic attitude. It is not unlikely that this feeling may soon be translated into higher prices. Furthermore, sellers insist that additional buying must soon develop inasmuch as current mill backlogs indicate a high operating rate for July, and, by the same token, considerable scrap consumption.

A Youngstown mill has purchased 20,000 tons of No. 1 steel at the market level, and a Buffalo consumer has placed an order for 7500 tons of No. 2 at a price 75c. better than last week's quotation. In addition, fresh business is in prospect in eastern Pennsylvania, the market tone has strengthened at Pittsburgh, and Chicago brokers are finding it necessary to pay premiums to fill old orders. All these indications point to some recovery in the scrap composite during the next fortnight although a steady, dependable and sizable advance is not likely before early fall.

Pittsburgh

This market remains steady with a firm undertone. The price of No. 1 steel averages $13.50, and those dealers covering $13.50 consumer orders are finding it practically impossible to pick up any steel at less than $13.25. A short interest, which is covering a sale at higher levels, is still purchasing No. 1 at around $13.75. Dealers here feel that the next price will be higher than $13.50. However, this may be voicing a wish. Nevertheless the consensus among dealers and some consumers is that scrap prices here are scraping bottom. Meanwhile, sales involving a few thousand tons at $13.50 have been made during the past week.

Chicago

Users of specialties are easing into the market, their idea being to accumulate tonnages slowly and thereby, without disturbing the market, take all possible advantage of current prices. Steel foundries, sighting good railroad business at hand, are particularly anxious to assure scrap supplies. Heavy melting steel is listless in so far as mill purchases are concerned. However, brokers are still busily covering old commitments, and they are paying premiums for all purchases which are being applied against orders taken below $13.50. The Illinois Central has recently sold this steel mill grade at the equivalent of $13.75 a gross ton, delivered.

Cleveland

A Youngstown district consumer during the week purchased 20,000 tons of steel-making scrap, nearly all Nos. 1 and 2 heavy melting steel, paying $13.50 for the former and $13 for the latter. The purchase also included a small tonnage of machine shop turnings at $10.25. Activity among local brokers is rather limited, as they do not have much scrap left on order for delivery to Cleveland consumers. Prices are steady and unchanged. While the supply is not over plentiful, brokers are having no trouble in buying all the scrap they need to fill orders at ruling quotations.

Philadelphia

Consumption in this district continues at a rapid pace, and several mills will probably be forced to buy scrap within the next fortnight. This potential demand and the current slackness in yard preparation have perceptibly bolstered price sentiment. It is doubtful whether any broker would sell a tonnage of No. 1 under $12 at the present time, in fact even a higher figure may hold for any volume of new business. A boat is expected in next week to take 8500 tons from Port Richmond to Japan, but the export market here as a whole is not very active. Northern Metal Co. successfully bid in five destroyers for $58,200, and these boats must be scrapped before the end of the year. The five vessels will yield about 3500 tons of steel and non-ferrous metal. Ten more destroyers will be up for scrapping within the next 60 days.

Buffalo

Important purchases of No. 2 steel and allied commodities were made by two of the larger mills. One mill bought 5000 to 7500 tons of No. 2 at $11.75, while the other bought about 2000 tons of No. 2 at $11.75. Lots of No. 1 machinery cast have been sold at $13 to $13.50, and stove plate has sold in small volume at $11. Cast iron borings are bringing $8.50.

Boston

For Pennsylvania shipment, bundled skeleton and busheling is now $6.40 a ton at the shipping point, as against a top of $6.25 a week ago. Otherwise domestic prices have not changed and shipments have dropped to a minimum. The export market, however, is more active. A steamer with 5400 tons sailed from here June 21 for Jugoslovakia, the first vessel ever to leave here for that country. Previously, 4857 tons was loaded for Japan. A boat is scheduled to arrive this week to load turnings for which $4.75, delivered Army base, is being paid, and

New York

Although prices remain unchanged, the market this week has a definitely stronger undertone. Fresh inquiry, however, is not as active as the rate of operations would indicate. Additional buying may soon develop, since the mills, having been out of the market for several weeks, will be needing new supplies to meet their melting schedules.

Detroit

With practically no purchasing in the past week, this market remains slow but firm. Supplies in the large automobile plants are low, and brokers are finding it difficult to buy metal in any quantities in anticipation of a possible price rise in the early fall. Demand is expected to be slack for some time, however, since steel mills have ample stocks to cover nearby requirements.

St. Louis

A number of items are priced higher as a result of purchases during the week by an East Side mill. The market gained strength also by reason of short covering by dealers, who expect prices to be higher. Also, there is a scarcity of offerings.

Cincinnati

With mills reporting scrap inventories approaching 30-day needs, new buying is almost nil. Small quantities of foundry scrap and fill-in orders for steel needs make up the bulk of current business. Quotations are unchanged, but considered formal.

Iron and Steel Scrap Prices

PITTSBURGH

Per gross ton delivered to consumer:

No. 1 hvy. mltng. steel.	$13.25 to	$13.75
No. 2 hvy. mltng. steel.	12.25 to	12.75
No. 2 RR. wrought....	13.25 to	13.75
Scrap rails	13.50 to	14.00
Rails, 3 ft. and under..	16.00 to	16.50
Comp. sheet steel.....	13.25 to	13.75
Hand bundled sheets..	12.25 to	12.75
Hvy. steel axle turn...	11.75 to	12.25
Machine shop turn....	9.00 to	9.50
Short shov. turn.....	9.25 to	9.75
Mixed bor. & turn. ...	7.50 to	8.00
Cast iron borings.....	10.00 to	10.50
Cast iron carwheels...	13.50 to	14.00
Hvy. breakable cast..	12.50 to	13.00
No. 1 cast	14.50 to	15.00
R.R. knuckles & cplrs..	16.50 to	17.00
Rail. coil & leaf springs	16.50 to	17.00
Rolled steel wheels....	16.50 to	17.00
Low phos. billet crops.	17.50 to	18.00
Low phos. sh. bar.....	17.00 to	17.50
Low phos. punchings.	16.25 to	16.75
Low phos. plate scrap.	16.00 to	16.50
Steel car axles	15.50 to	16.00

CLEVELAND

Per gross ton delivered to consumer:

No. 1 hvy. mltng. steel.	$12.50 to	$13.00
No. 2 hvy. mltng. steel.	11.50 to	12.00
Comp. sheet steel	11.50 to	12.00
Light bund. stampings	8.50 to	9.00
Drop forge flashings...	11.50 to	12.00
Machine shop turn....	7.50 to	8.00
Short shov. turn.	8.25 to	8.75
No. 1 busheling	8.25 to	8.75
Steel axle turnings....	8.25 to	8.75
Low phos. billet crops	17.00 to	17.50
Cast iron borings	8.25 to	8.50
Mixed bor. & turn.....	8.25 to	8.50
No. 2 busheling	8.25 to	8.50
No. 1 cast	14.50 to	15.00
Railroad grate bars...	8.00 to	8.50
Stove plate	9.00 to	9.50
Rails under 3 ft.	16.00 to	16.50
Rails for rolling	16.50 to	17.00
Railroad malleable ...	17.00 to	17.50
Cast iron carwheels...	....	15.50

PHILADELPHIA

Per gross ton delivered to consumer:

No. 1 hvy. mltng. steel.	....	$12.00
No. 2 hvy. mltng. steel.	....	11.00
Hydraulic bund., new.	$12.00 to	12.50
Hydraulic bund., old..	9.00 to	9.50
Steel rails for rolling..	15.00 to	15.50
Cast iron carwheels...	13.50 to	14.00
Hvy. breakable cast...	12.50 to	13.00
No. 1 cast	13.50 to	14.00
Stove plate (steel wks.)	10.00 to	10.50
Railroad malleable ...	....	16.50
Machine shop turn....	8.00 to	8.50
No. 1 blast furnace....	....	6.25
Cast borings	....	6.00
Heavy axle turnings..	11.00 to	11.50
No. 1 low phos. hvy....	16.00 to	16.50
Couplers & knuckles..	16.00 to	16.50
Rolled steel wheels....	16.00 to	16.50
Steel axles	16.00 to	16.50
Shafting	18.50 to	19.00
No. 1 RR. wrought....	14.50 to	15.00
Spec. iron & steel pipe	12.00 to	12.50
Bundled sheets	12.00 to	12.50
No. 1 forge fire	12.00 to	12.50
Cast borings (chem.)..	10.50 to	13.00

CHICAGO

Delivered to Chicago district consumers:

	Per Gross Ton	
Hvy. mltng. steel.....	$12.50 to	$13.00
Auto. hvy. mltng. steel	11.00 to	11.50
Shoveling steel	12.50 to	13.00
Hydraul. comp. sheets.	11.50 to	12.00
Drop forge flashings..	11.50 to	12.00
No. 1 busheling.....	11.50 to	12.00
Rolled carwheels	14.50 to	15.00
Railroad tires cut	14.00 to	14.50
Railroad leaf springs..	14.00 to	14.50
Axle turnings	12.00 to	12.50
Steel coup. & knuckles	14.00 to	14.50
Coil springs	15.00 to	15.50
Axle turn. (elec.).....	12.75 to	13.25
Low phos. punchings..	15.00 to	15.50
Low phos. plates, 12 in. and under	15.00 to	15.50
Cast iron borings	6.00 to	6.50
Short shov. turnings..	6.25 to	6.75
Machine shop turn....	5.50 to	6.00
Rerolling rails	14.00 to	14.50
Steel rails under 3 ft...	14.75 to	15.25
Steel rails under 2 ft...	15.25 to	15.75
Angle bars, steel	14.50 to	15.00
Cast iron carwheels ..	13.50 to	14.00
Railroad malleable ...	15.50 to	16.00
Agric. malleable	13.50 to	14.00
	Per Net Ton	
Iron car axles	$17.50 to	$18.00
Steel car axles	14.75 to	15.25
No. 1 RR. wrought....	11.50 to	12.00
No. 2 RR. wrought....	11.00 to	11.50
No. 2 busheling, old...	$6.00 to	$6.50
Locomotive tires	12.00 to	12.50
Pipes and flues	8.00 to	8.50
No. 1 machinery cast..	12.00 to	12.50
Clean auto. cast	11.00 to	11.50
No. 1 railroad cast....	11.00 to	11.50
No. 1 agric. cast.....	10.00 to	10.50
Stove plate	7.00 to	7.50
Grate bars	8.50 to	9.00
Brake shoes	8.50 to	9.00

BUFFALO

Per gross ton, f.o.b. consumers' plants:

No. 1 hvy. mltng. steel.	$12.00 to	$12.50
No. 2 hvy. mltng. steel.	11.25 to	11.75
Scrap rails	12.00 to	12.50
New hy. b'ndled sheets	11.25 to	11.75
Old hydraul. bundles..	10.25 to	10.75
Drop forge flashings..	11.25 to	11.75
No. 1 busheling	11.25 to	11.75
Hvy. axle turnings...	10.50 to	11.00
Machine shop turn....	6.00 to	6.50
Knuckles & couplers..	15.00 to	15.50
Coil & leaf springs....	15.00 to	15.50
Rolled steel wheels....	15.00 to	15.50
Low phos. billet crops.	15.50 to	16.00
Short shov. turnings..	9.00 to	9.50
Mixed bor. & turn....	8.00 to	8.50
Cast iron borings.....	8.00 to	8.50
No. 2 bushelings	....	6.50
Steel car axles	13.50 to	14.00
Iron axles	12.00 to	12.50
No. 1 machinery cast..	13.00 to	13.50
No. 1 cupola cast.....	12.00 to	12.50
Stove plate	10.50 to	11.00
Steel rails, under 3 ft.	15.75 to	16.25
Cast iron carwheels...	11.50 to	12.00
Railroad malleable	15.00 to	15.50
Chemical borings	9.00 to	9.50

BIRMINGHAM

Per gross ton delivered to consumer:

Hvy. melting steel....	$11.00 to	$11.50
Scrap steel rails.....	11.50 to	12.00
Short shov. turnings..	....	7.00
Stove plates	....	8.00
Steel axles	12.00 to	12.50
Iron axles	12.00 to	12.50
No. 1 RR. wrought....	8.50 to	9.00
Rails for rolling	12.50 to	13.00
No. 1 cast	12.00 to	12.50
Tramcar wheels	11.00 to	12.00

ST. LOUIS

Dealers' buying prices per gross ton delivered to consumer:

Selected hvy. steel....	$12.50 to	$13.00
No. 1 hvy. melting....	12.25 to	12.75
No. 2 hvy. melting....	9.75 to	10.25
No. 1 locomotive tires.	11.00 to	11.50
Misc. stand-sec. rails..	13.00 to	13.50
Railroad springs	13.50 to	14.00
Bundled sheets	9.50 to	10.00
No. 2 RR. wrought....	12.00 to	12.50
No. 1 busheling	7.50 to	8.00
Cast bor. & turn.....	4.00 to	4.50
Rails for rolling	14.00 to	14.50
Machine shop turn....	4.00 to	4.50
Heavy turnings	9.25 to	9.75
Steel car axles	13.00 to	13.50
Iron car axles	15.00 to	16.00
No. 1 RR. wrought....	10.50 to	11.00
Steel rails under 3 ft...	14.25 to	14.75
Steel angle bars	14.00 to	14.50
Cast iron carwheels...	11.00 to	11.50
No. 1 machinery cast.	10.75 to	11.25
Railroad malleable ...	13.50 to	14.00
No. 1 railroad cast....	11.00 to	11.50
Stove plate	7.50 to	8.00
Agricul. malleable	12.50 to	13.00

CINCINNATI

Dealers' buying prices per gross ton:

No. 1 hvy. mltng. steel.	$9.50 to	$10.00
No. 2 hvy. mltng. steel.	7.50 to	8.00
Scrap rails for mltng.	10.00 to	10.50
Loose sheet clippings.	5.25 to	5.75
Bundled sheets	7.25 to	7.75
Cast iron borings	4.50 to	5.00
Machine shop turn	5.25 to	5.75
No. 1 busheling	8.00 to	8.50
No. 2 busheling	3.75 to	4.25
Rails for rolling	10.50 to	11.00
No. 1 locomotive tires	9.00 to	9.50
Short rails	13.50 to	14.00
Cast iron carwheels ..	10.00 to	10.50
No. 1 machinery cast..	11.00 to	11.50
No. 1 railroad cast....	10.25 to	10.75
Burnt cast	7.25 to	7.75
Stove plates	7.25 to	7.75
Agricul. malleable	9.25 to	9.75
Railroad malleable	11.00 to	11.50

DETROIT

Dealers' buying prices per gross ton:

No. 1 hvy. mltng. steel.	$9.50 to	$10.00
No. 2 hvy. mltng. steel.	8.50 to	9.00
Borings and turnings.	5.50 to	6.00
Long turnings	5.50 to	6.00
Short shov. turnings..	6.00 to	6.50
No. 1 machinery cast..	14.50 to	15.00
Automotive cast	$13.25 to	$13.75
Hydraul. comp. sheets	9.75 to	10.25
Stove plate	8.75 to	9.25
New factory bushel...	9.00 to	9.50
Old No. 2 busheling...	5.00 to	5.50
Sheet clippings	6.50 to	7.00
Flashings	8.50 to	9.00
Low phos. plate scrap	10.00 to	10.50

CANADA

Dealers' buying prices per gross ton:

	Toronto	Montreal
Hvy. melting steel.....	$7.50	$7.00
Rails, scrap	8.50	8.00
Machine shop turn.....	4.00	4.00
Boiler plate	7.00	6.00
Hvy. axle turnings.....	4.50	4.00
Cast borings	5.00	4.50
Steel borings	4.00	4.00
Wrought pipe	4.00	4.00
Steel axles	8.50	9.00
Axles, wrought iron....	9.00	9.50
No. 1 machinery cast..	11.50	11.00
Stove plate	7.50	7.00
Standard carwheels	11.00	10.50
Malleable	7.00	7.00
Shoveling steel	6.50	6.00
Bushelings	6.00	5.50
Compressed sheets	6.50	6.00

YOUNGSTOWN

Per gross ton delivered to consumer:

No. 1 hvy. mltng. steel.	$13.00 to	$13.50
Hydraulic bundles	13.00 to	13.50
Machine shop turn....	9.00 to	9.50

NEW YORK

Dealers' buying prices per gross ton:

No. 1 hvy. mltng. steel.	$8.75 to	$9.25
No. 2 hvy. mltng. steel.	7.50 to	8.00
Hvy. breakable cast..	8.00 to	8.50
No. 1 machinery cast.	9.00 to	9.50
No. 2 cast	7.75 to	8.25
Stove plate	6.75 to	7.25
Steel car axles	13.00 to	13.50
Shafting	14.00 to	14.50
No. 1 RR. wrought....	9.00 to	9.50
No. 1 wrought long....	8.50 to	9.00
Spec. iron & steel pipe	8.50 to	9.00
Forge fire	7.50 to	8.00
Rails for rolling.....	10.50 to	11.00
Short shov. turnings..	5.00 to	5.50
Machine shop turn....	4.50 to	5.00
Cast borings	4.50 to	5.00
No. 1 blast furnace....	3.00 to	3.50
Cast borings (chem.)..	9.50 to	10.50
Unprepar. yard scrap.	5.00 to	5.50

Per gross ton, delivered local foundries:

No. 1 machin. cast....	....	$11.50
No. 1 hvy. cast cupola.	....	9.50
No. 2 cast	....	8.00

Add 50c. to 75c. to above quotations to secure North Jersey prices.

BOSTON

Dealers' buying prices per gross ton:

No. 1 hvy. mltng. steel.	$7.50 to	$7.90
Scrap rails	7.50 to	8.00
No. 2 steel	6.50 to	6.90
Breakable cast	7.00 to	7.25
Machine shop turn....	3.00 to	3.40
Bund. skeleton, long..	....	6.40
Shafting	13.00 to	13.50
Cast bor., chemical...	5.00 to	7.00
Cotton ties	5.75 to	6.00

Per gross ton delivered consumers' yards:

Textile cast	$10.50 to	$11.00
No. 1 machin. cast....	10.50 to	11.00
Stove plate	....	9.00

EXPORT

Brokers' buying prices per gross ton:

New York, delivered alongside barges	
No. 1 hvy. mltng. steel.	$9.50
No. 2 hvy. mltng. steel.	8.50
No. 2 cast	$8.00 to 8.50
Stove plate	7.00 to 7.25
Rails (scrap)	10.50 to 11.00
Philadelphia, on cars at Port Richmond	
No. 1 heavy melting steel.....	$11.00
Boston, on cars at Army Base or Mystic Wharf	
No. 1 hvy. mltng. steel.	$10.50
No. 2 hvy. mltng. steel.	9.50
Rails (scrap)	.... 10.50
Stove plate	.... 7.50
Machine shop turn ...	$4.75 to 5.00
New Orleans, on cars at Stuyvesant Dock	
No. 1 hvy. mltng. steel.	$10.00 to $10.50
No. 2 hvy. mltng. steel.	9.00 to 9.50
Los Angeles, on cars or trucks at local piers	
No. 1 hvy. mltng. steel.	$10.50 to $11.00
Compressed bundles ..	8.50 to 9.00

PRICES ON FINISHED AND SEMI-FINISHED IRON AND STEEL

SEMI-FINISHED STEEL

Billets, Blooms and Slabs

F.o.b. Pittsburgh, Chicago, Gary, Cleveland, Youngstown, Buffalo, Birmingham. Prices at Duluth are $2 a ton higher, and delivered Detroit $3 higher.

	Per Gross Ton
Rerolling	$28.00
Forging quality	35.00

Sheet Bars

F.o.b. Pittsburgh, Chicago, Cleveland, Youngstown, Buffalo, Canton, Sparrows Point, Md.

	Per Gross Ton
Open-hearth or Bessemer	$28.00

Skelp

F.o.b. Pittsburgh, Chicago, Youngstown, Buffalo, Coatesvile, Pa., Sparrows Point, Md.

	Per Lb.
Grooved, universal and sheared	1.80c.

Wire Rods

(Nos. 4 and 5)

	Per Gross Ton
F.o.b. Pittsburgh or Cleveland	$38.00
F.o.b. Chicago, Youngstown or Anderson, Ind.	39.00
F.o.b. Worcester, Mass.	40.00
F.o.b. Birmingham	41.00
F.o.b. San Francisco	47.00
F.o.b. Galveston	44.00

BARS, PLATES, SHAPES

Iron and Steel Bars

Soft Steel

	Base per Lb.
F.o.b. Pittsburgh	1.85c.
F.o.b. Chicago or Gary	1.90c.
F.o.b. Duluth	2.00c.
Del'd Detroit	2.00c.
F.o.b. Cleveland	1.90c.
F.o.b. Buffalo	1.95c.
Del'd Philadelphia	2.16c.
Del'd New York	2.20c.
F.o.b. Birmingham	2.00c.
F.o.b. cars dock Gulf ports	2.25c.
F.o.b. cars Pacific ports	2.40c.

Rail Steel

(For merchant trade)

F.o.b. Pittsburgh	1.70c.
F.o.b. Cleveland, Chicago, Gary or Moline, Ill.	1.75c.
F.o.b. Buffalo	1.80c.
F.o.b. Birmingham	1.85c.
F.o.b. cars dock Gulf ports	2.10c.
F.o.b. cars dock Pacific ports	2.25c.

Billet Steel Reinforcing

(Straight lengths as quoted by distributors)

F.o.b. Pittsburgh	2.05c.
F.o.b. Buffalo, Cleveland, Youngstown, Chicago, Gary or Birmingham	2.10c.
Del'd Detroit	2.20c.
F.o.b. cars dock Gulf ports	2.45c.
F.o.b. cars dock Pacific ports	2.45c.

Rail Steel Reinforcing

(Straight lengths as quoted by distributors)

F.o.b. Pittsburgh	1.90c.
F.o.b. Buffalo, Cleveland, Youngstown, Chicago, Gary or Birmingham	1.95c.
F.o.b. cars dock Gulf ports	2.30c.
F.o.b. cars dock Pacific ports	2.30c.

Iron

F.o.b. Chicago	1.80c.
F.o.b. Pittsburgh (refined)	2.10c.
Delivered New York	2.05c.
Delivered Philadelphia	2.10c.

Cold Finished Bars and Shafting*

	Base per Lb.
F.o.b. Pittsburgh	2.10c.
F.o.b. Cleveland, Chicago and Gary	2.15c.
F.o.b. Buffalo	2.20c.
Del'd Detroit	2.30c.
Del'd eastern Michigan	2.35c.

*In quantities of 10,000 to 19,999 lb.

Plates

	Base per Lb.
F.o.b. Pittsburgh	1.80c.
F.o.b. Chicago or Gary	1.85c.
Del'd Cleveland	1.995c.
F.o.b. Coatesville or Spar. Pt.	1.90c.
Del'd Philadelphia	1.99c.
Del'd New York	2.09c.
F.o.b. Birmingham	1.95c.
F.o.b. cars dock Gulf ports	2.20c.
F.o.b. cars dock Pacific ports	2.35c.
Wrought iron plates, f.o.b. Pittsburgh	3.20c.

Floor Plates

F.o.b. Pittsburgh	3.35c.
F.o.b. Chicago	3.40c.
F.o.b. Coatesville	3.45c.
F.o.b. cars dock Gulf ports	3.75c.
F.o.b. cars dock Pacific ports	3.90c.

Structural Shapes

	Base per Lb.
F.o.b. Pittsburgh	1.80c.
F.o.b. Chicago	1.85c.
Del'd Cleveland	1.995c.
F.o.b. Buffalo or Bethlehem	1.90c.
Del'd Philadelphia	2.015c.
Del'd New York	2.0625c.
F.o.b. Birmingham (standard)	1.95c.
F.o.b. cars dock Gulf ports	2.20c.
F.o.b. cars dock Pacific ports	2.35c.

Steel Sheet Piling

	Base per Lb.
F.o.b. Pittsburgh	2.15c.
F.o.b. Chicago or Buffalo	2.25c.
F.o.b. cars dock Gulf or Pacific Coast ports	2.60c.

RAILS AND TRACK SUPPLIES

F.o.b. Mill

Standard rails, heavier than 60 lb. per gross ton	$36.37½
Angle bars, per 100 lb.	2.55

F.o.b. Code Basing Points

Light rails (from billets) per gross ton	$35.00
Light rails (from rail steel) per gross ton	34.00

	Base per 100 Lb.
Spikes	2.60
Tie plates, steel	1.90
Tie plates, Pacific Coast ports	2.00
Track bolts, to steam railroads	3.60
Track bolts, to jobbers, all sizes (per 100 counts) 70 per cent off list	

Basing points on light rails are Pittsburgh, Chicago and Birmingham; on spikes and tie plates, Pittsburgh, Chicago, Buffalo, Portsmouth, Ohio, Weirton, W. Va., St. Louis, Kansas City, Minnequa, Colo., Birmingham and Pacific Coast ports; on tie plates alone, Steelton Pa.; on spikes alone, Cleveland, Youngstown, Lebanon, Pa., Columbia, Pa., Richmond, Va.

SHEETS, STRIP, TIN PLATE, TERNE PLATE

Sheets

Hot Rolled

	Base per Lb.
No. 10, f.o.b. Pittsburgh	1.85c.
No. 10, f.o.b. Gary	1.95c.
No. 10, del'd Detroit	2.05c.
No. 10, del'd Philadelphia	2.16c.
No. 10, f.o.b. Birmingham	2.00c.
No. 10, f.o.b. cars dock Pacific ports	2.40c.
Hot-Rolled Annealed	
No. 24, f.o.b. Pittsburgh	2.40c.
No. 24, f.o.b. Gary	2.50c.
No. 24, del'd Detroit	2.45c. to 2.60c.
No. 24, del'd Philadelphia	2.71c.
No. 24, f.o.b. Birmingham	2.55c.
No. 24, f.o.b. cars dock Pacific ports	3.05c.
No. 24, wrought iron, Pittsburgh	4.30c.

Heavy Cold-Rolled

No. 10 gage, f.o.b. Pittsburgh	2.50c.
No. 10 gage, f.o.b. Gary	2.60c.
No. 10 gage, f.o.b. Detroit	2.70c.
No. 10 gage, del'd Philadelphia	2.81c.
No. 10 gage, f.o.b. Birmingham	2.65c.
No. 10 gage, f.o.b. cars dock Pacific ports	3.10c.

Light Cold-Rolled

No. 20 gage, f.o.b. Pittsburgh	2.95c.
No. 20 gage, f.o.b. Gary	3.05c.
No. 20 gage, del'd Detroit	3.15c.
No. 20 gage, del'd Philadelphia	3.26c.
No. 20 gage, f.o.b. Birmingham	3.10c.
No. 20 f.o.b. cars dock Pacific ports	3.50c.

Galvanized Sheets

No. 24 gage, f.o.b. Pittsburgh	3.10c.
No. 24, f.o.b. Gary	3.20c.
No. 24, del'd Philadelphia	3.41c.
No. 24, f.o.b. Birmingham	3.25c.
No. 24, f.o.b. cars dock Pacific ports	3.70c.
No. 24, wrought iron, Pittsburgh	4.95c.

Long Ternes

No. 24, unassorted 8-lb. coating f.o.b. Pittsburgh	3.40c.
F.o.b. Gary	3.50c.
F.o.b. cars dock Pacific ports	4.10c.

Vitreous Enameling Stock

No. 20, f.o.b. Pittsburgh	2.95c.
No. 20, f.o.b. Gary	3.05c.
No. 20, f.o.b. Birmingham	3.55c.
No. 20, f.o.b. cars dock Pacific ports	3.55c.

Tin Mill Black Plate

No. 28, f.o.b. Pittsburgh	2.75c.
No. 28, Gary	2.85c.
No. 28, cars dock Pacific ports	3.35c.

Tin Plate

	Base per Box
Standard cokes, f.o.b. Pittsburgh district mill	$5.25
Standard cokes, f.o.b. Gary	5.35
Standard cokes, f.o.b. cars dock Pacific ports	5.90

Terne Plate

(F.o.b. Pittsburgh)

(Per Package, 20 x 28 in.)

8-lb. coating I.C.	$10.00
15-lb. coating I.C.	12.00
20-lb. coating I.C.	13.00
25-lb. coating I.C.	14.00
30-lb. coating I.C.	15.25
40-lb. coating I.C.	17.50

Hot-Rolled Hoops, Bands, Strips and Flats under ¼ In.

	Base per Lb.
All widths up to 24 in., P'gh.	1.85c.
All widths up to 24 in., Chicago	1.95c.
All widths up to 24 in., del'd Detroit	2.05c.
All widths up to 24 in., Birmingham	2.00c.
Cooperage stock, Pittsburgh	1.95c.
Cooperage stock, Chicago	2.05c.

Cold-Rolled Strips*

	Base per Lb.
F.o.b. Pittsburgh	2.60c.
F.o.b. Cleveland	2.60c.
Del'd Chicago	2.895c.
F.o.b. Worcester	2.80c.

* Carbon 0.25 and less.

Fender Stock

No. 14, Pittsburgh or Cleveland	2.90c.
No. 14, Worcester	3.30c.
No. 20, Pittsburgh or Cleveland	3.30c.
No. 20, Worcester	3.70c.

WIRE PRODUCTS

(Carload lots, f.o.b. Pittsburgh and Cleveland.)

To Manufacturing Trade

	Per Lb.
Bright wire	2.40c.
Spring wire	3.05c.

Chicago prices on products sold to the manufacturing trade are $1 a ton above Pittsburgh or Cleveland. Worcester and Duluth prices are $2 a ton above, Birmingham $3 above, and Pacific Coast prices $9 a ton above Pittsburgh or Cleveland.

To the Trade

	Base per Keg
Standard wire nails	$2.10
Smooth coated nails	2.10

	Base per 100 Lb.
Annealed fence wire	$2.65
Galvanized fence wire	3.00
Polished staples	2.80
Galvanized staples	3.05
Barbed wire, galvanized	2.60
Twisted barbless wire	2.60
Woven wire fence, base column	58
Single loop bale ties, base column	51

Chicago and Anderson, Ind., mill prices are $1 a ton over Pittsburgh base (on all products except woven wire fence, for which the Chicago price is $2 above Pittsburgh); Duluth, Minn., mill prices are $2 a ton over Pittsburgh except for woven wire fence, which is $3 over Pittsburgh and Birmingham mill prices are $3 a ton over Pittsburgh.

On wire nails, barbed wire and staples, prices at Houston, Galveston and Corpus Christi, Tex., New Orleans, Lake Charles, La., and Mobile, Ala., are $6 a ton over Pittsburgh.

On nails, staples and barbed wire, prices of $6 a ton above Pittsburgh are also quoted at Beaumont and Orange, Tex.

STEEL AND WROUGHT IRON PIPE AND TUBING

Welded Pipe

Base Discounts, f.o.b. Pittsburgh District and Lorain, Ohio, Mills

F.o.b. Pittsburgh only on wrought iron pipe.

Butt Weld

Steel In.	Black	Galv.	*Wrought Iron* In.	Black	Galv.
⅛	57	37	⅛	+91½	+138
¼ to ⅜	60	44½	¼ & ⅜	+1½	+21½
½	64½	55	½	31½	15
¾	67½	59	¾	36½	20½
1 to 3	69½	61½	1 & 1¼	39½	25½
			1½	43½	28
			2	41½	26

Lap Weld

2	62	53½	37	22½
2½ to 3.65		56½	2½ to 3½	38 25
3½ to 6.67		58½	4 to 8	40 28½
7 & 8.66		56½	9 to 12	38 24½
9 & 10.65		56½		
11 & 12.64		55½		

Butt Weld, extra strong, plain ends

⅛	55	42½	⅛ +13	+45½
¼ to ⅜	57	46½	¼ & ⅜	+2½ +34½
½	62	54½	½	32½ 17½
¾	66½	58½	¾	37½ 22½
1 to 3	68	61	1 to 2	43½ 29

Lap Weld, extra strong, plain ends

2	60	52½	2	40 26
2½ to 3.64		56½	2½ to 4	45½ 33
3½ to 6.67½		60	4½ to 6	45 33½
7 & 8.66½		57	7 & 8	.46 33
9 & 10.65½		56	9 to 12.41½	30
11 & 12.64½		55		

On butt-weld and lap-weld steel pipe jobbers are granted a discount of 5%. On less-than-carload shipments prices are determined by adding 25 and 30% and the carload freight rate to the base card.

Note—Chicago district mills have a base two points less than the above discounts. Chicago delivered base is 2½ points less. Freight is figured from Pittsburgh, Lorain, Ohio, and Chicago district mills, the billing being from the point producing the lowest price to destination.

Boiler Tubes

Seamless Steel Commercial Boiler Tubes and Locomotive Tubes

(Net base prices per 100 ft. f.o.b. Pittsburgh in carload lots)

		Cold Drawn	Hot Rolled
1 in. o.d.	13 B.W.G.	$ 8.60	$ 7.82
1¼ in. o.d.	13 B.W.G.	10.19	9.26
1½ in. o.d.	13 B.W.G.	11.26	10.23
1¾ in. o.d.	13 B.W.G.	12.81	11.64
2 in. o.d.	13 B.W.G.	14.35	13.04
2¼ in. o.d.	13 B.W.G.	16.00	14.54
2¼ in. o.d.	12 B.W.G.	17.61	16.01
2½ in. o.d.	12 B.W.G.	19.29	17.54
*2¾ in. o.d.	12 B.W.G.	20.45	18.59
3 in. o.d.	12 B.W.G.	$21.45	$19.50
4½ in o.d.	10 B.W.G.	41.08	37.35
3½ in. o.d.	11 B.W.G.	27.09	24.62
4 in. o.d.	10 B.W.G.	33.60	30.54
4½ in. o.d.	10 B.W.G.	41.08	37.35
5 in. o.d.	9 B.W.G.	51.56	46.87
6 in. o.d.	7 B.W.G.	79.15	71.90

Extra for less-carload quantities:

25,000 lb. or ft. to 39,999 lb. or ft.	5 %
12,000 lb. or ft. to 24,999 lb. or ft.	12½ %
6,000 lb. or ft. to 11,999 lb. or ft.	25 %
2,000 lb. or ft. to 5,999 lb. or ft.	35 %
Under 2,000 lb. or ft.	50 %

CAST IRON WATER PIPE

Per Net Ton

*6-in. and larger, del'd Chicago.	$48.40
6-in. and larger, del'd New York	45.20
*6-in. and larger, Birmingham	40.00
6-in. and larger, f.o.b. dock, San Francisco or Los Angeles	48.00
F.o.b. dock, Seattle	48.50
F.o.b. dock, Seattle	51.50

Class "A" and gas pipe, $3 extra. 4-in. pipe is $3 a ton above 6-in.

* Prices for lots of less than 200 tons. For 200 tons and over, 6-in. and larger is $39, Birmingham, and $47.40, delivered Chicago and 4-in. pipe, $42, Birmingham, and $50.40 a ton, delivered Chicago.

BOLTS, NUTS, RIVETS, SET SCREWS

Bolts and Nuts

(F.o.b. Pittsburgh, Cleveland, Birmingham or Chicago)

Per Cent Off List

Machine and carriage bolts: ½ in. x 6 in. and smaller	70, 10 and 5 to 70 and 10
Larger than ½ in.	70 and 10 to 70 and 5
Lag bolts	70 and 10 to 70 and 5
Plow bolts, Nos. 1, 2, 3, and 7 heads	70 and 10 to 70 and 5
Hot-pressed nuts, blank or tapped, square	70 and 10 to 70 and 5
Hot-pressed nuts, blank or tapped, hexagon	70 and 10 to 70 and 5
C.p.c. and t. square or hex. nuts, blank or tapped	70 and 10 to 70 and 5
Semi-finished hexagon nuts, U.S.S. and S.A.E., all sizes	60, 20 and 15 to 60, 20 and 10
Stove bolts in packages, nuts attached	72½, 10 and 10 to 75
Stove bolts in packages, with nuts separate	72½, 10, 10 and 5 to 75 and 5
Stove bolts in bulk	82½
Tire bolts	55 to 50 and 5

On stove bolts freight is allowed to destination on 200 lb. and over.

Large Rivets

(½-in. and larger)

	Base per 100 Lb.
F.o.b. Pittsburgh or Cleveland	$2.90 to $3.05
F.o.b. Chicago or Birmingham	3.00 to 3.15

Small Rivets

(7/16-in. and smaller)

Per Cent Off List

F.o.b. Pittsburgh	70 and 5
F.o.b. Cleveland	70 and 5
F.o.b. Chicago and Birm'g'm.	70 and 5

Cap and Set Screws

(Freight allowed up to but not exceeding 65c. per 100 lbs. on lots of 200 lb. or more)

Per Cent Off List

Milled cap screws, 1 in. dia. and smaller	80, 10 and 10
Milled standard set screws, case hardened, 1 in. dia. and smaller	75
Milled headless set screws, cut thread ¾ in. and smaller	75
Upset hex. head cap screws U.S.S. or S.A.E. thread, 1 in and smaller	85
Upset set screws, cut and oval points	75 and 10
Milled studs	65 to 65 and 10

Alloy and Stainless Steel

Alloy Steel Blooms, Billets and Slabs

F.o.b. Pittsburgh, Chicago, Canton, Massillon, Buffalo, Bethlehem. Base price, $49 a gross ton.

Alloy Steel Bars

F.o.b. Pittsburgh, Chicago, Buffalo, Bethlehem, Massillon or Canton. Open-hearth grade, base 2.45c. Delivered price at Detroit is 2.60c.

S.A.E. Series Numbers	Alloy Differential per 100 lb.
2000 (1½% Nickel)	$0.25
2100 (2½% Nickel)	0.95
2300 (3½% Nickel)	1.50
2500 (5% Nickel)	2.25
3100 Nickel Chromium	0.55
3200 Nickel Chromium	1.35
3300 Nickel Chromium	3.80
3400 Nickel Chromium	3.20
4100 Chromium Molybdenum (0.15 to 0.25 Molybdenum)	0.50
4100 Chromium Molybdenum (0.25 to 0.40 Molybdenum)	0.70
4600 Nickel Molybdenum (0.20 to 0.30) Molybdenum (1.50 to 2.00 Nickel)	1.05
5100 Chromium Steel (0.60 to 0.90 Chromium)	0.35
5100 Chromium Steel (0.80 to 1.10 Chromium)	0.45
5100 Chromium Spring Steel	base
6100 Chromium Vanadium Bar	1.10c.
6100 Chromium Vanadium Spring Steel	$0.70
Chromium Nickel Vanadium	1.40
Carbon Vanadium	0.85

These prices are for hot-rolled steel bars. The differential for most grades in electric furnace steel is 50c. higher. The differential for cold-drawn bars ½c. per lb. higher with separate extras. Blooms, billets and slabs under 4x4 in. or equivalent are sold on the bar base. Slabs with a section area of 16 in. and 2½ in. thick or over take the billet base. Sections 4x4 in. to 10x10 in. or equivalent carry a gross ton price, which is the net price for bars for the same analysis. Larger sizes carry extras.

Alloy Cold-Finished Bars

F.o.b. Pittsburgh, Chicago, Gary, Cleveland or Buffalo, 2.95c. base per lb.

STAINLESS STEEL No. 302

(17 to 19% Cr, 7 to 9% Ni, 0.08 to 0.20% C.)

(Base Prices f.o.b. Pittsburgh)

	Per Lb.
Forging billets	19.55c.
Bars	23c.
Plates	26c.
Structural shapes	23c.
Sheets	33c.
Hot-rolled strip	20¾c.
Cold-rolled strip	27c.
Drawn wire	23c.

TOOL STEEL

	Base per Lb.
High speed	55c.
High carbon chrome	35c.
Oil hardening	20c.
Extra	15c.
Regular	12c.

Prices for warehouse distribution to all points on or East of Mississippi River are 2c. a lb. higher. West of Mississippi quotations are 3c. a lb. higher.

British and Continental

BRITISH

Per Gross Ton
f.o.b. United Kingdom Ports

Based on exchange rate as of June 8

Ferromanganese, export	$45.00
Billets, open-hearth	29.37 to $30.62
Tin plate, per base box	4.68 to 4.78
Steel bars, open-hearth	39.37
Beams, open-hearth	38.12
Channels, open-hearth	39.37
Angles, open-hearth	38.12
Black sheets, No. 24 gage	48.75
Galvanized sheets, No. 24 gage	58.75

CONTINENTAL

Per Metric Ton, f.o.b. Continental Ports

Based on Exchange rate of June 8

Billets, Thomas	$19.27
Wire rods, No. 5 B.W.G.	36.90
Steel bars, merchant	26.64
Sheet bars	19.68
Plate, ¼ in. and up	35.42
Plate, 3/16 in. and 5 mm.	34.85
Sheets, ⅛ in.	36.90
Beams, Thomas	25.58
Angles (Basic)	25.58
Hoops and strip base	32.79
Wire, plain, No. 8	44.03
Wire nails	47.15
Wire, barbed, 4 pt. No. 10 B.W.G.	71.74

IRON AND STEEL WAREHOUSE PRICES

PITTSBURGH

Base per Lb.

Plates	3.15c.
Structural shapes	3.15c.
Soft steel bars and small shapes	2.95c.
Reinforcing steel bars	2.95c.
Cold-finished and screw stock:	
Rounds and hexagons	3.35c.
Squares and flats	3.35c.
Hoops and bands under ¼ in.	3.20c.
Hot-rolled annealed sheets (No. 24), 25 or more bundles	3.30c.
Galv. sheets (No 24), 25 or more bundles	3.95c.
Hot-rolled sheets (No. 10)	2.95c.
Galv. corrug. sheets (No. 28), per square (more than 3750 lb.)	$3.69
Spikes, large	3.10c.
Track bolts, all sizes, per 100 count	65 per cent off list
Machine bolts, 100 count,	65 per cent off list
Carriage bolts, 100 count,	65 per cent off list
Nuts, all styles, 100 count,	65 per cent off list
Large rivets, base per 100 lb.	$3.80
Wire, black, soft ann'l'd, base per 100 lb.	2.90c.
Wire, galv. soft, base per 100 lb.	3.25c.
Common wire nails, per keg	2.35c.
Cement coated nails, per keg.	2.35c.

On plates, structurals, bars, reinforcing bars, bands, hoops and blue annealed sheets, base applies to orders of 400 to 9999 lb.

•Delivered in Pittsburgh switching district.

CHICAGO

Base per Lb.

Plates and structural shapes	3.20c.
Soft steel bars, rounds	3.00c.
Soft steel bars, squares and hexagons	3.15c.
Cold-fin. steel bars:	
Rounds and hexagons	3.50c.
Flats and squares	3.50c.
Hot-rolled strip	3.30c.
Hot-rolled annealed sheets (No. 24)	3.85c.
Galv. sheets (No. 24)	4.55c.
Hot-rolled sheets (No. 10)	3.05c.
Spikes (keg lots)	3.50c.
Track bolts (keg lots)	4.65c.
Rivets, structural (keg lots)	3.65c.
Rivets, boiler (keg lots)	3.75c.

Per Cent Off List

Machine bolts	•70
Carriage bolts	•70
Lag screws	•70
Hot-pressed nuts, sq. tap or blank	•70
Hot-pressed nuts, hex. tap or blank	•70
Hex. head cap screws	87½
Cut point set screws	75 and 10
Flat head bright wood screws	70
Spring cotters	55
Stove bolts in full packages	70
Rd. hd. tank rivets, 7/16 in. and smaller	57½
Wrought washers	$4.50 off list
Black ann'l'd wire per 100 lb.	$3.85
Com. wire nails, base per keg	2.95†
Cement c't'd nails, base per keg	2.95†

On plates, shapes, bars, hot-rolled strip and heavy hot-rolled sheets, the base applies on orders of 400 to 9999 lb. All prices are fo.b. consumers' plants within the Chicago switching district.

•These are quotations delivered to city trade for quantities of 100 lb. or more. For lots of less than 100 lb., the quotation is 65 per cent off. Discounts applying to country trade are 70 per cent off, f.o.b. Chicago, with full or partial freight allowed up to 50c. per 100 lb.

†Prices for city and suburbs only.

NEW YORK

Base per Lb.

Plates, ¼ in. and heavier	3.40c.
Structural shapes	3.37c.
Soft steel bars, rounds	3.31c.
Iron bars	3.31c.
Iron bars, Swed. char-coal	6.75c. to 7.00c.
Cold-fin. shafting and screw stock:	
Rounds and hexagons	3.81c.
Flats and squares	3.81c.
Cold-rolled; strip, soft and quarter hard	3.36c.
Hoops	3.56c.
Bands	3.56c.
Hot-rolled sheets (No. 10)	3.31c.
Hot-rolled ann'l'd sheets (No. 24•)	3.89c.
Galvanized sheets (No. 24•)	Special
Long terne sheets (No. 24)	5.25c.
Standard tool steel	11.00c.
Wire, black annealed (No. 10)	3.40c.
Wire, galv. (No. 10)	3.75c.
Tire steel, 1 x ½ in. and larger	3.75c.
Open-hearth spring steel	4.00c. to 10.00c.
Common wire nails, base per keg	$3.21

Per Cent Off List

Machine bolts, square head and nut:	
All diameters	65 and 10
Carriage bolts, cut thread:	
All diameters	65 and 10

Per 100 Ft.

Boiler tubes:	
Lap welded, 2-in.	$18.05
Seamless welded, 2-in.	19.24
Charcoal iron, 2-in.	24.94
Charcoal iron, 4-in.	63.65

•No. 28 and lighter, 36 in. wide, 20c. higher per 100 lb.

ST. LOUIS

Base per Lb.

Plates and struc. shapes	3.45c.
Bars, soft steel (rounds and flats)	3.25c.
Bars, soft steel (squares, hexagons, ovals, half ovals and half rounds)	3.40c.
Cold-fin. rounds, shafting, screw stock	3.75c.
Hot-rolled annealed sheets (No. 24)	4.10c.
Galv. sheets (No. 24)	4.65c.
Hot-rolled sheets (No. 10)	3.30c.
Black corrug. sheets (No. 24)	4.10c.
•Galv. corrug. sheets	4.65c.
Structural rivets	4.00c.
Boiler rivets	4.10c.

Per Cent Off List

Tank rivets, 7/16 in. and smaller.	55
Machine and carriage bolts, lag screws, fitting up bolts, bolt ends, plow bolts, hot-pressed nuts, square and hexagon, tapped or blank, semi-finished nuts; all quantities	70

•No. 26 and lighter take special prices.

PHILADELPHIA

Base per Lb.

•Plates, ¼-in. and heavier	2.98c.
•Structural shapes	2.98c.
•Soft steel bars, small shapes, iron bars (except bands)	3.03c.
‡Reinforc. steel bars, sq. twisted and deformed	2.96c.
Cold-finished steel bars	3.76c.
•Steel hoops	3.43c.
•Steel bands, No. 12 and 3/16 in. incl.	3.18c.
Spring steel	5.00c.
†Hot-rolled anneal. sheets (No. 24)	3.65c.
†Galvanized sheets (No. 24)	4.40c.
•Hot-rolled annealed sheets (No. 10)	3.08c.
Diam. pat. floor plates, ¼ in.	4.95c.
Swedish iron bars	6.25c.

These prices are subject to quantity differential except on reinforcing and Swedish iron bars.

•Base prices subject to deduction on orders aggregating 4000 lb. or over.

†For 25 bundles or over.

‡For less than 2000 lb.

CLEVELAND

Base per Lb.

Plates and struc. shapes	3.31c.
Soft steel bars	3.00c.
Reinforc. steel bars	2.10c.
†Cold-finished steel bars	3.50c.
Flat-rolled steel under ¼ in.	3.36c.
Cold-finished strip	†3.00c.
Hot-rolled annealed sheets (No. 24)	3.91c.
Galvanized sheets (No. 24)	4.61c.
Hot-rolled sheets (No. 10)	3.11c.
Hot-rolled 3/16 in. 24 to 48 in. wide sheets	3.56c.
•Black ann'l'd wire, per 100 lb.	$2.40
•No. 9 galv. wire, per 100 lb.	2.75
•Com. wire nails, base per keg	2.35

†Outside delivery 10c. less.

•For 5000 lb. or less.

CINCINNATI

Base per Lb.

Plates and struc. shapes	3.42c.
Bars, rounds, flats and angles.	3.22c.
Other shapes	3.37c.
Rail steel reinforc. bars	3.25c.
Hoops and bands, 3/16 in. and lighter	3.47c.
Cold-finished bars	3.72c.
Hot-rolled annealed sheets (No. 24)	4.02c.
Galv. sheets (No. 24) 500 lb. or less	4.47c.
Galvanized sheets (No. 24) over 500 lb.	4.07c.
Hot-rolled sheets (No. 10)	3.22c.
Structural rivets	4.35c.
Small rivets	55 per cent off list
No. 9 ann'l'd wire, per 100 lb. (1000 lb. or over)	$2.88
Com. wire nails, base per keg:	
Any quantity less than carload	3.04
Cement c't'd nails, base 100-lb. keg	3.50
Chain, lin. per 100 lb.	8.35

Net per 100 Ft.

Seamless steel boiler tubes,	
2-in.	$20.37
4-in.	48.14
Lap-welded steel boiler tubes,	
2-in.	19.38
4-in.	45.32

BUFFALO

Base per Lb.

Plates	3.38c.
Struc. shapes	3.25c.
Soft steel bars	3.05c.
Reinforcing bars	2.60c.
Cold-fin. flats and sq.	3.55c.
Rounds and hex.	3.55c.
Cold-rolled strip steel	3.19c.
Hot-rolled annealed sheets (No. 24)	4.06c.
Heavy hot-rolled sheets (3/16 in., 24 to 48 in. wide)	3.43c.
Galv. sheets (No. 24)	4.70c.
Bands	3.43c.
Hoops	3.43c.
Heavy hot-rolled sheets	3.18c.
Com. wire nails, base per keg.	$3.10
Black wire, base per 100 lb. (2500-lb. lots or under)	4.00
(Over 2500 lb.)	3.90

BOSTON

Base per Lb.

Beams, channels, angles, tees, zees	3.54c.
H beams and shapes	3.54c.
Plates — Sheared, tank, and univ. mill, ¼ in. thick and heavier	3.56c.
Floor plates, diamond pattern.	5.36c.
Bar and bar shapes (mild steel)	3.45c.
Bands 3/16 in. thick and No. 12 ga. incl.	3.65c. to 4.65c.
Half rounds, half ovals, ovals and bevels	4.70c.
Tire steel	4.70c.
Cold-rolled strip steel	3.245c.
Cold-finished rounds, squares and hexagons	3.90c.
Cold-finished flats	3.90c.
Blue annealed sheets, No. 10 ga.	3.65c.
One pass cold-rolled sheets No. 24 ga.	4.20c.
Galvanized steel sheets, No. 24 ga.	4.00c.
Lead coated sheets, No. 24 ga.	5.85c.

Price delivered by truck in metropolitan Boston, subject to quantity differentials.

DETROIT

	Base per Lb.
Soft steel bars	3.09c.
Structural shapes	3.42c.
Plates	3.42c.
Floor plates	5.17c.
Hot-rolled annealed sheets (No. 24)	3.94c.
Hot-rolled sheets (No. 10)	3.14c.
Galvanized sheets (No. 24)**	4.72c.
Bands	3.39c.
Hoops	3.39c.
†Cold-finished bars	3.64c.
Cold-rolled strip	3.18c.
Hot-rolled alloy steel (S.A.E. 3100 Series)	5.29c.*
Bolts and nuts, in cases,	70 and 10 per cent off list
Broken cases	70 per cent off

Prices delivered by truck in metropolitan Detroit, subject to quantity differentials.

*Price applies to 1,000 lb. and over.

†With reduction in chemical extras.

**0.25c. off list for 10 to 25 bundles; 0.50c. for 25 bundles and over, Detroit delivery only.

MILWAUKEE

	Base per Lb.
Plates and structural shapes	3.31c.
Soft steel bars, rounds up to 8 in., flats and fillet angles	3.11c.
Soft steel bars, squares and hexagons	3.26c.
Hot-rolled strip	3.41c.
Hot-rolled sheets (No. 10)	3.16c.
Hot-rolled annealed 3/16—24 in. to 48 in. wide incl.	3.41c.
Hot-rolled annealed sheets (No. 24)	3.96c.
Galvanized sheets (No. 20)	4.66c.
Cold-finished steel bars	3.61c.
Cold-rolled strip	3.33c.
Structural rivets (keg lots)	3.86c.
Boiler rivets, cone head (keg lots)	3.96c.
Track spikes (keg lots)	3.91c.
Track bolts (keg lots)	4.91c.
Black annealed wire	3.40c.
Com. wire nails	2.60c.
Cement coated nails	2.60c.

	Per Cent Off List
Machine bolts, carriage bolts and lag screws	70 to 75
Hot-pressed nuts, sq. and hex. tapped or blank (keg lots)	70

Prices given above are delivered Milwaukee.

On plates, shapes, bars, hot-rolled strip and heavy hot-rolled sheets, the base applies on orders of 400 to 9999 lb. On galvanized and No. 24 hot-rolled annealed sheets the prices given apply on orders of 400 to 1500 lb. On cold-finished bars the prices are for orders of 1000 lb. or more of a size.

ST. PAUL

	Base per Lb.
Mild steel bars, rounds	3.25c.
Structural shapes	3.45c.
Plates	3.45c.
Cold-finished bars	4.02c.
Bands and hoops	3.55c.
Hot-rolled annealed sheets, No. 24	3.90c.
Galvanized sheets, No. 24	4.50c.
Cold-rolled sheets, No. 20	4.95c.

On mild steel bars, shapes, plates and hoops and bands the base applies on 400 to 14,999 lb. On hot-rolled sheets, galvanized sheets and cold-rolled sheets base applies on 15,000 lb. and over. Base on cold-finished bars is 1000 lb. and over of a size.

BALTIMORE

	Base per Lb.
*Mild steel bars	3.00c.
**Reinforcing bars	2.85c.
*Structural shapes	3.00c.
†Plates	3.00c.
†Hot-rolled sheets, No. 10	3.10c.
‡Hot-rolled annealed sheets, No. 24	3.60c.
‡Galvanized sheets, No. 24	4.30c.
*Bands	3.20c.
*Hoops	3.45c.
§Cold-rolled rounds	3.73c.
§Cold-rolled squares, hex. and flats	3.73c.
Rivets	4.40c.
Bolts and nuts, per cent off list	60 and 10

*Quantity extras per size apply.

†Quantity extras per thickness apply. Hot-rolled quantity extras are: 2000 lb. and over, base: 1500 lb. to 1999 lb. add 15c. per 100 lb.; 1000 lb. to 1499 lb. add 30c.; 0 to 999 lb., add 50c.

‡25 bundles and over, base. For 1 to 9 bundles add 50c. per 100 lb.; for 10 to 24 bundles add 25c.

§Base for 1000 lb. and over. For 500 to 999 lb. add 25c. per 100 lb.; for 300 to 499 lb. add $1.00; for 0 to 299 lb. add $1.75; for combined order under 100 lb. add $3.00.

**For orders 4000 lb. to 9999 lb. Add 15c. per 100 lb. for orders 2000 to 3999 lb.; add 65c. for orders less than 2000 lb.

CHATTANOOGA

	Base per Lb.
Mild steel bars	3.36c.
Iron bars	3.36c.
Reinforcing bars	3.36c.
Structural shapes	3.56c.
Plates	3.56c.
Hot-rolled sheets, No. 10	3.36c.
Hot-rolled annealed sheets No. 24	4.16c.
Galvanized sheets, No. 24	4.86c.
Steel bands	3.61c.
Cold-finished bars	4.13c.

MEMPHIS

	Base per Lb.
Mild steel bars	3.47c.
Shapes, bar size	3.47c.
Iron bars	3.47c.
Structural shapes	3.67c.
Plates	3.67c.
Hot-rolled sheets, No. 10	3.47c.
Hot-rolled annealed sheets, No. 24	4.27c.
Galvanized sheets, No. 24	4.80c.
Steel bands	3.72c.
Cold-drawn rounds	3.89c.
Cold-drawn flats, squares, hexagons	5.89c.
Structural rivets	4.25c.
Bolts and nuts, per cent off list	70
Small rivets, per cent off list	50

NEW ORLEANS

	Base per Lb.
Mild steel bars	3.35c.
Reinforcing bars	3.50c.
Structural shapes	3.55c.
Plates	3.55c.
Hot-rolled sheets, No. 10	3.55c.
Hot-rolled annealed sheets, No. 24	4.35c.
Galvanized sheets, No. 24	4.95c.
Steel bands	3.95c.
Cold-finished steel bars	4.30c.
Structural rivets	4.25c.
Boiler rivets	4.25c.
Common wire nails, base per keg	$2.65
Bolts and nuts, per cent off list	70

PACIFIC COAST

	Base per Lb. San Francisco	Los Angeles	Seattle
Plates, tank and U. M.	3.25c.	3.60c.	3.80c.
Shapes, standard	3.25c.	3.60c.	3.80c.
Soft steel bars	3.25c.	3.60c.	3.95c.
Reinforcing bars, f.o.b. cars dock Pacific ports	2.45c.	2.45c.	2.45c.
Hot-rolled annealed sheets (No. 24)	4.10c.	4.35c.	4.40c.
Hot-rolled sheets (No. 10)	3.35c.	3.70c.	3.75c.
Galv. sheets (No. 24 and lighter)	4.50c.	4.40c.	5.00c.
Galv. sheets (No. 22 and heavier)	5.00c.	4.60c.	5.00c.
Cold finished steel			
Rounds	5.80c.	5.85c.	6.00c.
Squares and hexagons	7.05c.	7.10c.	7.25c.
Flats	7.55c.	7.60c.	8.25c.
Common wire nails—base per keg less carload	$2.90	$2.90	$2.90

All items subject to differentials for quantity.

REFRACTORIES PRICES

Fire Clay Brick

	Per 1000 f.o.b. Works
High-heat duty, Pennsylvania, Maryland, Kentucky, Missouri and Illinois	$45.00
High-heat duty, New Jersey	50.00
High-heat duty, Ohio	40.00
Intermediate, Pennsylvania, Maryland, Kentucky, Missouri and Illinois	40.00
Intermediate, New Jersey	43.00
Intermediate, Ohio	35.00
Ground fire clay, per ton	7.00

Silica Brick

	Per 1000 f.o.b. Works
Pennsylvania	$45.00
Chicago District	54.00
Birmingham	$48.00 to 50.00
Silica cement per net ton	8.00

Chrome Brick

	Per Net Ton
Standard f.o.b Baltimore, Plymouth Meeting and Chester	$45.00
Chemically bonded f.o.b. Baltimore, Plymouth Meeting and Chester, Pa.	45.00

Magnesite Brick

	Per Net Ton
Standard, f.o.b. Baltimore and Chester, Pa.	$65.00
Chemically bonded, f.o.b. Baltimore	55.00

Grain Magnesite

	Per Net Ton
Imported, f.o.b. Baltimore and Chester, Pa. (in sacks)	$45.00
Domestic, f.o.b. Baltimore and Chester, in sacks	40.00
Domestic, f.o.b. Chewelah, Wash.	22.00

RAW MATERIALS PRICES

PIG IRON

No. 2 Foundry

F.o.b. Everett, Mass.; Bethlehem, Birdsboro and Swedeland, Pa., and Sparrows Point, Md.	$20.50
Delivered Brooklyn	22.9289
Delivered Newark or Jersey City	21.9873
Delivered Philadelphia	21.3132
F.o.b. Neville Island, Sharpsville and Erie, Pa.; Buffalo; Youngstown, Cleveland, Toledo and Hamilton, Ohio; Detroit; Chicago and Granite City, Ill.	19.50
F.o.b. Jackson, Ohio	21.25
Delivered Cincinnati	20.5807
F.o.b. Duluth	20.00
F.o.b. Provo, Utah	17.50
Delivered San Francisco, Los Angeles or Seattle	22.315
F.o.b. Birmingham*	15.50

* Delivered prices on southern iron for shipment to northern points are 38c. a ton below delivered prices from nearest northern basing point.

Malleable

Base prices on malleable iron are 50c. a ton above No. 2 foundry quotations at Everett, Eastern Pennsylvania furnaces, Erie and Buffalo. Elsewhere they are the same.

Basic

F.o.b. Everett, Mass.; Bethlehem, Birdsboro, Swedeland and Steelton, Pa., and Sparrows Point, Md.	$20.00
Delivered Boston Switching District	20.50
Delivered Newark or Jersey City	21.4873
Delivered Philadelphia	20.8132
F.o.b. Buffalo	18.50
F.o.b. Neville Island, Sharpsville and Erie, Pa.; Youngstown, Cleveland, Toledo and Hamilton, Ohio; Detroit; Chicago and Granite City, Ill.	19.00
Delivered Cincinnati	20.0807
Delivered Canton, Ohio	20.3482
Delivered Mansfield, Ohio	20.8832
F.o.b. Jackson, Ohio	20.75
F.o.b. Provo, Utah	17.00
F.o.b. Birmingham	14.50

Bessemer

F.o.b. Everett, Mass.; Bethlehem, Birdsboro and Swedeland, Pa.	$21.50
Delivered Boston Switching District	22.00
Delivered Newark or Jersey City	22.9873
Delivered Philadelphia	22.3132
F.o.b. Buffalo and Erie, Pa., and Duluth	20.50
F.o.b. Neville Island and Sharpsville, Pa.; Youngstown, Cleveland, Toledo and Hamilton, Ohio; Detroit; Chicago and Birmingham	20.00
Delivered Cincinnati	21.0807
Delivered Canton, Ohio	21.3482
Delivered Mansfield, Ohio	21.8832

Low Phosphorus

Basing points: Birdsboro, Pa., Steelton, Pa., and Standish, N. Y.	$24.00

Gray Forge

Valley or Pittsburgh furnace	$19.00

Charcoal

Lake Superior furnace	$22.00
Delivered Chicago	25.2528

Canadian Pig Iron

Per Gross Ton

Delivered Toronto.

No. 1 fdy., sil. 2.25 to 2.75	$21.00
No. 2 fdy., sil. 1.75 to 2.75	20.50
Malleable	22.50

Delivered Montreal

No. 1 fdy., sil. 2.25 to 2.75	$22.50
No. 2 fdy., sil. 1.75 to 2.25	22.00
Malleable	22.50
Basic	22.00

FERROALLOYS

Ferromanganese

F.o.b. New York, Philadelphia, Baltimore, Mobile or New Orleans.

Per Gross Ton

Domestic, 80% (carload)	$75.00

Spiegeleisen

Per Gross Ton Furnace

Domestic, 19 to 21%	$26.00
50-ton lots 3-mo. shipment	24.00
F.o.b. New Orleans	26.00

Electric Ferrosilicon

Per Gross Ton Delivered

50% (carloads)	$77.50
50% (ton lots)	85.00
75% (carloads)	126.00
75% (ton lots)	130.00

Silvery Iron

Per Gross Ton

F.o.b. Jackson, Ohio, 6.00 to 6.50%	$22.75

For each additional 0.5% silicon up to 12%, 50c. a ton is added.

The lower all-rail delivered price from Jackson or Buffalo is quoted with freight allowed. Base prices at Buffalo are $1.25 a ton higher than at Jackson.

Manganese 2 to 3%, $1 a ton additional. For each unit of manganese over 3%, $1 a ton additional. Phosphorus 0.75% or over, $1 a ton additional.

Bessemer Ferrosilicon

F.o.b. Jackson, Ohio, Furnace

Per Gross Ton		*Per Gross Ton*	
10.00 to 10.50%	$27.75	13%	$31.75
10.51 to 11.00%	28.25	14%	33.25
11.00 to 11.50%	28.75	15%	34.75
11.51 to 12.00%	29.25	16%	36.25
12%	30.25	17%	37.75

Manganese 2 to 3%, $1 a ton additional. For each unit of manganese over 3%, $1 a ton additional. Phosphorus 0.75% or over, $1 a ton additional.

Base prices at Buffalo are $1.25 a ton higher than at Jackson.

Other Ferroalloys

Ferrotungsten, per lb. contained W del., carloads	$1.30
Ferrotungsten, lots of 5000 lb.	1.35
Ferrotungsten, smaller lots	1.40
Ferrochromium, 4 to 6% carbon and up, 65 to 70% Cr per lb. contained Cr delivered, in carloads, and contract	10.00c.
Ferrochromium, 2% carbon	16.50c. to 17.00c.
Ferrochromium, 1% carbon	17.50c. to 18.00c.
Ferrochromium, 0.10% carbon	19.50c. to 20.00c.
Ferrochromium, 0.06% carbon	20.00c. to 20.50c.
Ferrovanadium, del. per lb. contained V.	$2.70 to $2.90
Ferrocolumbium, per lb. contained columbium, f.o.b. Niagara Falls, N. Y.	$2.50
Ferrocarbontitanium, 15 to 18% Ti, 7 to 8% C, f.o.b. furnace carload and contract per net ton	$137.50
Ferrocarbontitanium, 17 to 20% Ti, 3 to 5% C, f.o.b. furnace, carload and contract, per net ton	142.50
Ferrophosphorus, electric, or blast furnace material, in carloads, f.o.b. Anniston, Ala., for 18%, with $3 unitage, freight equalized with Rockdale, Tenn., per gross ton	58.50
Ferrophosphorus, electric, 24%, in carlots, f.o.b. Anniston, Ala., per gross ton with $3 unitage, freight equalized with Nashville, Tenn.	75.00
Ferromolybdenum, per lb. Mo del.	95c.
Calcium molybdate, per lb. Mo del.	80c.
Silico spiegel, per ton, f.o.b. furnace, carloads	$38.00
Ton lots or less, per ton	45.50
Silico-manganese, gross ton, delivered.	
2.50% carbon grade	85.00
2% carbon grade	90.00
1% carbon grade	100.00
Spot prices	$5 a ton higher

ORES

Lake Superior Ores

Delivered Lower Lake Ports

Per Gross Ton

Old range, Bessemer, 51.50%	$4.80
Old range, non-Bessemer, 51.50%	4.65
Mesabi, Bessemer, 51.50%	4.65
Mesabi, non-Bessemer, 51.50%	4.50
High phosphorus, 51.50%	4.40

Foreign Ore

C.i.f. Philadelphia or Baltimore

Per Unit

Iron, low phos., copper free, 55 to 58% dry Spain or Algeria	10.25c.
Iron, low phos., Swedish, average, 68½% iron	10.25c.
Iron, basic or foundry, Swedish, aver. 65% iron	9.50c.
Iron, basic or foundry, Russian, aver. 65% iron	Nominal
Man., Caucasian, washed 52%.	26c.
Man., African, Indian, 44-48%.	25c.
Man., African, Indian, 49-51%.	26c.
Man., Brazilian, 46 to 48½%	24c.

Per Net Ton Unit

Tungsten, Chinese, wolframite, duty paid, delivered, nominal	16.00
Tungsten, domestic, scheelite delivered, nominal	16.00

Per Gross Ton

Chrome, 45% Cr_2O_3, lump, c.i.f. Atlantic Seaboard (African)	$17.50
45 to 46% Cr_2O_3 (Turkish)	$16.50 to 17.00
48% Cr_2O_3 (African)	20.50
48% min. Cr_2O_3 (Turkish)	19.25
Chrome concentrate, 50% and over Cr_2O_3, c.i.f. Atlantic ports	22.00
52% Cr_2O_3 (Turkish)	21.75
48 to 49% Cr_2O_3 (Turkish)	19.25

FLUORSPAR

Per Net Ton

Domestic, washed gravel, 85-5, f.o.b. Kentucky and Illinois mines, all rail	$18.00
Domestic, barge and rail	19.00
No. 2 lump, 85-5, f.o.b. Kentucky and Illinois mines	20.00
Foreign, 85% calcium fluoride, not over 5% silicon, c.i.f. Atlantic ports, duty paid	21.50
Domestic No. 1 ground bulk, 95 to 98% calcium fluoride, not over 2½% silicon, f.o.b. Illinois and Kentucky mines	35.00

FUEL OIL

Per Gal.

F.o.b. Bayonne or Baltimore, No. 3 distillate	4.25c.
F.o.b. Bayonne or Baltimore, No. 4 industrial	3.75c.
Del'd Ch'go, No. 3 industrial	5.00c.
Del'd Ch'go, No. 5 industrial	3.77c.
F.o.b. Cleveland, No. 3 distillate	6.00c.
F.o.b. Cleveland, No. 5 industrial	5.00c.

COKE AND COAL

Coke

Per Net Ton

Furnace, f.o.b. Connellsville Prompt	$3.65 to $3.80
Foundry, f.o.b. Connellsville Prompt	4.25 to 5.75
Foundry, by - product, Chicago ovens	9.00
Foundry, by - product, del'd New England	11.50
Foundry, by - product, del'd Newark or Jersey City	9.65
Foundry, by - product, Philadelphia	9.38
Foundry, by - product, delivered Cleveland	9.75
Foundry, by - product, delivered Cincinnati	9.50
Foundry, Birmingham	6.50
Foundry, by - product, St. Louis, f.o.b. ovens	8.00
Foundry, from Birmingham, f.o.b. cars docks, Pacific ports	14.75

Coal

Per Net Ton

Mine run steam coal, f.o.b. W. Pa. mines	$1.50 to $1.75
Mine run coking coal, f.o.b. W. Pa.	1.90 to 2.10
Gas coal, ¾-in. f.o.b. Pa. mines	2.00 to 2.25
Mine run gas coal, f.o.b. Pa. mines	1.80 to 2.00
Steam slack, f.o.b. W. Pa. mines	1.00 to 1.25
Gas slack, f.o.b. W. Pa. mines	1.20 to 1.45


For
High Quality
STEELS
NIAGARA
BRAND
FERRO-ALLOYS
FERRO SILICON
ALL GRADES
FERRO CHROMIUM
HIGH CARBON
FERRO CHROMIUM
LOW CARBON
FERRO MANGANESE
SILICO MANGANESE
PITTSBURGH METALLURGICAL CO., INC.
NIAGARA FALLS, N.Y.

Federal Trade Commission Issues Consent Decree Against 15 Tin Plate Makers

WASHINGTON, June 23.—The Federal Trade Commission has issued a consent order against 15 tin plate manufacturers who are specifically directed to cease and desist from entering into agreements to refuse to sell stock tin plate to jobbers and to manufacturers of tin cans and other metal containers. The order is the outgrowth of a complaint issued by the commission which, among other things, charged that the alleged practices were discriminatory against both jobbers and small manufacturers of tin cans and other containers said to be dependent on "stock plate" for their supply.

Hearings had been scheduled in the case but were withdrawn when arrangements were made for a consent order. The tin plate makers were also ordered to cease acting in cooperation by entering into agreements to mutilate "stock plate" so as to classify it either in the domestic or foreign markets. According to the findings, some of the stock plate produced and accumulated by the respondents since Jan. 1, 1935, has been sold as production plate at prices higher than normally received for stock plate and some stock plate cut up into such shapes as to render it unfit for manufacturers of tin cans or containers, has been classified as "waste-waste" and sold for domestic consumption.

It was further charged that some of the producers have classified some grades of stock plate as "waste-waste" and have sold it for export without mutilation of shape. It was also declared that the respondents have required purchasers of production plate to accept "seconds" up to 25 per cent of their orders.

In answering the commission complaint the tin plate makers pointed out that they were operating under the former NRA steel code and that the code made the sale of tin plate at less than filed prices, whether directly by overgrading or otherwise, a violation of the code. They also stated that many manufacturers, acting under the code, sold tin plate as stock plate which should properly have been classified as production plate. These practices, it was declared, were unfair to manufacturers or purchasers of tin plate.

The commission, however, declined to accept the responses as justification for the alleged practices. Besides charging that the practices restricted competition, the commission order said they resulted in enhanced stock plate prices and tended to create a monopoly in the manufacture of tin containers in the American Can Co. and the Continental Can Co. by depriving small competitors of their normal supply of tin plate and forcing them to purchase production plate at prices substantially higher than they formerly paid for stock plate.

The respondents are American Sheet & Tin Plate Co. (now a unit of Carnegie-Illinois Steel Corp.), Bethlehem Steel Co., Canton Tin Plate Corp., Columbia Steel Co., Follansbee Brothers Co., Inland Steel Co., Jones & Laughlin Steel Corp., McKeesport Tin Plate Co., Republic Steel Corp., N. & G. Taylor Co., Washington Tin Plate Co., Weirton Steel Co., Wheeling Steel Corp., Youngstown Sheet & Tube Co. and Granite City Steel Co.



. . . Awards of 5000 tons —25,300 tons in new projects.

AWARDS

Buffalo, 200 tons, Buffalo sewer construction, to Buffalo Steel Co., Tonawanda.

Buffalo, 800 tons, Buffalo sewer construction, to Jones & Laughlin Steel Corp.

Lycoming County, Pa., 200 tons, highway, to Bethlehem Steel Co. through Hempt Brothers, general contractor.

Chicago, 100 tons, Outer Drive bridge work, to Concrete Engineering Co.

State of Illinois, 200 tons, road work, to Calumet Steel Co.

Yellowstone National Park, Wyo., 150 tons, bridge for Bureau of Public Roads, to an unnamed bidder.

Los Angeles, 1250 tons, for United States Engineers, Proposal No. 719, to Soule Steel Co.

Sacramento, Cal., 100 tons, State overhead crossing at Jibboom Street, to Concrete Engineering Co.

San Francisco, 960 tons, Alemany Boulevard sewer, to Soule Steel Co.

Portland, Ore., 800 tons, State overhead crossing on Union Avenue, to an unnamed bidder.

Salem, Ore., 250 tons, city reservoir, to an unnamed bidder.

NEW REINFORCING BAR PROJECTS

Pittsfield, Mass., 125 tons, State road.

Revere, Mass., 200 tons, State road.

Lunenburg, Mass., 100 tons, bridge over Boston & Maine Railroad.

Chicago, 200 tons, Fleishman Malting Co.

Chicago, 575 tons, Wieboldt department store; R. C. Wieboldt Co., general contractor.

State of Illinois, 500 tons, highway bridge work.

St. Louis, 500 tons, Kingshighway viaduct; bids June 25.

St. Louis, 230 tons, Wabash Railway grade separations; bids June 25.

Denver, 3500 tons, reinforced concrete pipe on conduit No. 16, alternates on steel pipe; bids June 30.

San Francisco, 500 tons, two hangar buildings on Yerba Buena shoals; bids opened June 24.

Albuquerque, N. M., 214 tons, two State grade separations; bids June 26.

Los Angeles, 18,900 tons, for United States Engineers, Proposal No. 741; bids opened June 23.

Portland, Ore., 335 tons, State viaduct on Oregon City highway; bids June 26.

Shearing Strip at High Speed

(CONCLUDED FROM PAGE 71)

a leveler or pinch roll feed is used, there would occur an objectionable instantaneous slippage of the sheet in the rolls unless special provision is made to avoid such a possibility. This difficulty is overcome by locating the "feed" far enough away from the shear to allow for a looping skid before the strip enters the shear. The strip is allowed to sag during the "feed" interval enough to compensate for the pull during the cutting interval. An air-operated pinch roll can be engaged to push the last end of the strip through the shear after it has passed out of the leveler.

Production requirements ordinarily control the type of shear to be used. Sometimes two units are advisable at the end of a hot-strip mill where shifts from coil to sheet production are frequent. The first shear is usually designed to crop the leading end of the strip and then cut the strip into consecutive uniform lengths, being synchronized with the work rolls of the last mill stand. The second shear would be used only for cropping the front and rear end of the strip going to the coilers. This unit requires only a simple start and stop motor unit. Each mill has its own problems and flying shears must be designed individually to meet these conditions.



THIS WEEK'S MACHINE TOOL ACTIVITIES

. . . Replacement machine buying continues steady.

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. . . Rolling mill equipment builders gain on long-standing backlog.

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. . . Splitting of orders for like-purpose machines widens employment.

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By L. M. WAITE

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THE high pressure machine tool buying of the past few months has settled down to a routine of consistent regularity in equipment replacements, with the automotive industry demanding definite production gains as the basis of replacement.

Anticipation of requirements is again being vigorously stressed by heads of selling organizations and departments who are conversant with possible program-buying developments during the fall months.

Over wide areas, that peculiar degree of confidence which precedes machine tool buying remains effective. June has shown no indication of any troublesome summer slump in orders. Backlog continues heavy. Skilled labor shortages are constantly reported.

Studied order allotments, by large buyers, covering individual types of like purpose machines, have become a factor in machine tool activity. They represent a major contribution to greater permanency in employments in machine tool centers and localities. The development has been made possible through wider general perfection in competing equipment. This increased breadth of machine equality is said to give a far greater buyer latitude within ranges of rapid production and necessary accuracies.

Pittsburgh

Inquiries maintain a steady volume. Order volume records an increase for the week and remains good from day to day for individual machines. Proposals embodying engineering detail are specifying five to seven months' delivery. On some standard equipment, deliveries have been advanced to 10 and 12 weeks. Builders of rolling mill equipment are working off some backlog on major jobs. There are, however, new projects in view. Replacements and repairs are active. Small tools and secondary equipment of time-saving value are in demand.

Detroit

With summer on and immediate automotive programs cleaned up except for minor adjustments which are always present in quantity buying, there is a definite easing-off of machine tool orders. Inquiries continue in fair volume for replacement equipment on a cost reduction basis. Dealers look to a resumption of large-scale buying in the fall months.

Purchase lists by the Detroit and Dearborn Boards of Education call for 71 lathes, in sizes 11 to 15 in., and a few millers, shapers, grinders and small auxiliary equipment. Detroit high school bids were closed on June 23, and caused little excitement, as price limits ran from $500 to $800, and, additionally, 53 lathe trade-ins were involved.

Chicago

Orders remain at the higher level established during the past few weeks, and are sufficient in volume to maintain dealer records of unfilled orders, despite shipments. There has been a dropping of inquiries during the week. The Rock Island list for Silva, Ill., shops has not yet appeared, but the road is inquiring for a geared head lathe for Shawnee, Okla., and for a car journal lathe for Chicago. The Milwaukee road is in the market for a 42-in. hydraulic shaper-planer, a six-spindle angle cock grinder, a 54-in. x 9-ft. lathe, a 20-in. balancing machine, a hand-operated bushing press, and three drills, 20-, 26- and 30-in.

Cleveland

Delayed deliveries on new machines continue to create activity in used equipment, particularly for shipment to England. Second-hand dealers are experiencing difficulty in locating high-grade offerings. A local dealer handled an English order for six large machines this week. A leading Ohio lathe builder is eight weeks behind on deliveries. Manufacturers of large horizontal and vertical boring mills are not promising shipments sooner than three to six months, depending upon size. Some pending business in the northern Ohio territory is being held up because of labor troubles.

Cincinnati

Demand for the week was made up of one- and two-unit orders, well scattered. Drilling machinery lagged, although a few orders were reported. Foreign demand was not heavy and was confined to a few orders for grinding and milling machines. Recently cancelled and readvertised Government business holds attention of lathe builders; it is said that the new call involves 26 small lathes. Some additional orders were offered on preferred deliveries, but could not be handled. This fact has started another drive on the urgency of order booking.

Pacific Coast

Competition for a rather steady volume of orders for individual machines is keen. Direct sellers have added to their follow-up forces. Dealers are giving close attention to a volume of inquiries which serves to continue an optimistic feeling that the summer months may produce a very reasonable amount of business. One or two makers of specialized machines are said to be considering steady Coast activity as a result of inquiries received. Another manufacturer who relies upon infrequent Coast trips for orders, is giving thought to Coast activity because of two orders received recently.

PLANT EXPANSION AND EQUIPMENT BUYING



. . . Spreckels Sugar Co., San Francisco, has plans for new beet sugar mill to cost $1,500,000 with equipment.

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. . . AC Spark Plug Co., Flint, Mich., has approved plans for an addition costing $150,000 complete.

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. . . Acme Industrial Co., Chicago, die makers' equipment, has let contract for a new plant to cost $100,000 including equipment.

NEW ENGLAND

Draper Corp., Hopedale, Mass., manufacturer of textile mill machinery and parts, has let general contract to John Bathelt Construction Co., 216 Pine Street, Holyoke, Mass., for extensions and improvements in foundry. Cost about $35,000 with equipment. F. P. Sheldon & Son, Hospital Trust Building, Providence, R. I., are engineers.

Commanding Officer, Ordnance Department, Springfield Armory, Springfield, Mass., asks bids until July 10 for eight star gages for machine gun barrels (Circular 249).

Olds & Whipple, Inc., 166 State Street, Hartford, Conn., manufacturer of commercial fertilizers, has let general contract to Bartlett-Brainard Co., 16 Van Dyke Avenue, for one-story addition, 135 x 145 ft. Cost over $75,000 with equipment. Mylchreest & Reynolds, 238 Palm Street, are architects and engineers.

Duke Machine Co., 76 Lafayette Street, Salem, Mass., has let general contract to Pitman & Brown Co., 40 Bridge Street, for one-story addition, 44 x 50 ft.

Gerstein Cooper Co., 1 West Third Street, Boston, operating a general coppersmithing and kindred metal-working plant, has let general contract to M. Slotnick, 333 Washington Street, for one-story addition, 45 x 86 ft. Cost about $40,000 with equipment. Edmund I. Leeds, 263 Harrison Avenue, is architect.

Ernst Hollander Iron & Metal Corp., Chelsea, Boston, recently organized, has taken over property formerly used by J. Lipsitz Iron Co. for new scrap iron and metal plant. Improvements will be made, with installation of complete mechanical equipment for handling of scrap, conveyers, loaders, etc. Ernst Hollander is president.

NORTH ATLANTIC

Electrolux, Inc., 500 Fifth Avenue, New York, manufacturer of vacuum cleaners, parts, etc., has asked bids on general contract for three-story addition to plant at Old Greenwich, Conn., 100 x 150 ft. Cost over $100,000 with equipment. C. A. Rudin is company engineer.

Board of Education, 500 Park Avenue, New York, plans manual training departments in new Lafayette high school, Brooklyn, and new high school at east Bronx, to cost over $1,000,000 with equipment. Bids will be asked on general contracts in near future. William C. Martin, Flatbush Avenue Extension and Concord Street, Brooklyn, is architect.

West Virginia Pulp & Paper Co., 230 Park Avenue, New York, has let general contract to Morton C. Tuttle Co., 31 St. James Avenue, Boston, for new multi-unit kraft pulp and paper mill in port terminal district, Charleston, S. C. Cost about $5,000,000 with equipment. Company has applied for permission to develop a water terminal in Battery Creek district, Jericho Point, Beaufort section, including wharf and mechanical-handling facilities for timber supply for new mill. Cost over $100,000 with equipment. Company is also planning development of timber lands for raw material supply, with construction of saw mills, boiler plants and other structures.

McKesson & Robbins, Inc., 155 East Forty-fourth Street, New York, drug specialties, etc., has arranged for lease of two-story building, about 55,000 sq. ft. floor space, to be erected at Court, Georgia and Fourth Streets, Buffalo, by Bardol Co., for new factory branch, storage and distributing plant. Cost over $300,000 with equipment. G. Morton Wolfe, 1377 Main Street, Buffalo, is architect.

Village Council, Saranac Lake, N. Y., plans early election to approve bonds for about $475,000 for new municipal electric power plant and distributing system. Burns & McDowell Engineering Co., 107 West Linwood Boulevard, Kansas City, Mo., and 11 North Pearl Street, Albany, N. Y., is consulting engineer.

Department of Sanitation, 125 Worth Street, New York, Thomas W. Hammond, commissioner, has been authorized to purchase, modernize and repair snow-removal machinery and automotive equipment, street-flushing and other road equipment. Fund of $8,000,000 has been approved for project.

Campbell Soup Co., Camden, N. J., has plans for addition to plant at Chicago for can-cooling and other service. Cost over $80,000 with machinery. Battey & Kipp, Inc., 231 South LaSalle Street, Chicago, is architect and engineer.

Commanding Officer, Ordnance Department, Raritan Arsenal, Raritan, N. J., asks bids until July 6 for one 14-in. toolroom lathe, one radial drill, one 21-in. drilling and tapping machine, two 6-in. and one 8-in. floor or pedestal grinders (Circular 6).

Ershler & Krukin, Inc., 4933 Boulevard, West New York, N. J., manufacturer of stainless steel kitchen and restaurant equipment, has leased one-story building, 20,000 sq. ft. floor space, at 166-86 West Fifty-second Street, Bayonne, N. J., for new plant, and will remove to new location and increase capacity.

William Gordon, Inc., 450 Palisade Avenue, West New York, N. J., liquor distiller, plans new plant at Des Moines, Iowa, for production of gin, including a rectifying unit for other liquors. Cost close to $100,000 with equipment. Company is being formed, capitalized at $200,000, to carry out project. William S. Gordon is head. Ralph and Herbert Thompson, Muscatine, Iowa, are interested in new company.

Commanding Officer, Ordnance Department, Frankford Arsenal, Philadelphia, asks bids until June 29 for 34,830 springs (Circular 543), one enclosed automatic motor starter (Circular 548); until June 30 for reworking 24,000 lb. primer cup brass into 24,000 lb. special 70/30 primer brass, and reworking 16,000 lb. brass scrap into 16,000 lb. cartridge brass (Circular 519), reworking bullets, pig lead, zinc, etc., into 150,000 lb. lead antimony alloy (Circular 522); until July 1 for reworking 800,000 lb. cartridge brass scrap, fired shells, into 800,000 lb. cartridge brass cups, 48,000 lb. similar brass scrap into 48,000 lb. like conversion, and reworking 560,000 lb. cartridge brass scrap clips and cartridge brass trimmings into 560,000 lb. cartridge brass cups (Circular 520), for 480,000 ft. of free-machining steel rod, .441-in. diameter (Circular 524).

Board of Public Education, Administration Building, Parkway and Twenty-first Streets, Philadelphia, asks bids on general contract until June 30 for new multi-story vocational school on Lehigh Avenue. Cost over $800,000 with equipment. A. B. Anderson is secretary and business manager.

Scott Welding Service, Inc., has leased building at Starr Avenue and 84th Street, Long Island City, N. Y., and will specialize in electric welding construction and repair of heavy castings, cranes, steel bodies and trailers.

BUFFALO DISTRICT

Marlin-Rockwell Corp., Chandler Street, Jamestown, N. Y., manufacturer of ball and roller bearings, and kindred steel specialties, has let general contract to Warren Construction Co., 335 Steele Street, for one-story addition, 50 x 150 ft., in part for storage and distribution. Cost over $50,000 with equipment.

Eddy Paper Corp., Three Rivers, Mich., manufacturer of liner board, box board and kindred paperboard products, has acquired property at Olean, N. Y., for new converting plant for manufacture of folding containers, cartons, etc. Initial unit will be one-story, 80 x 250 ft. Cost close to $75,000 with machinery. Company is affiliated with Kieckhefer Container Co., West Canal Street, Milwaukee.

Evans Brewery, Inc., Binghamton, N. Y., Edward J. Whalen, president, recently organized, has taken over former Laurer brewery and will remodel for production of ale. An addition is planned later. Cost over $50,000 with equipment. Company will succeed to business of C. H. Evans & Son, Inc. James M. Key will be vice-president in charge of production.

WASHINGTON DIST.

Chemical Warfare Service, Edgewood Arsenal, Md., asks bids until July 1 for 10,100 empty aluminum cartridge shells (Circular 104).

Bureau of Yards and Docks, Navy Department, Washington, asks bids (no closing date stated) for new steel floating drydock, 1016 ft. long, at Pearl Harbor Naval Station, Hawaii (Specifications 8228). Fund of $10,000,000 has been authorized for structure, including machinery.

City Council, Danville, Va., plans extensions and improvements in steam-operated

electric generating plant, including new equipment. Cost about $100,000. City plans new municipal hydroelectric power plant on Dan River, Patrick County, and first noted station will be used as a standby unit when latter project is completed. Fund of $2,750,000 has been secured through Federal aid for hydroelectric power development, including 60-mile transmission line to municipality. Charles T. Main, Inc., 201 Devonshire Street, Boston, is consulting engineer for last noted project.

Architect of Capitol, Washington, asks bids until July 10 for plate, tray and belt conveyers for annex and main building of Library of Congress.

Baker Engineering Equipment Corp., Norfolk, Va., manufacturer of mechanical equipment, parts, etc., is establishing new plant on Norfolk Street, comprising three one-story units, for which general contract recently was let to Davis & Spiers, and Allen J. Saville, Norfolk. Cost over $50,000 with machinery.

Bureau of Supplies and Accounts, Navy Department, Washington, asks bids until July 3 for one motor-driven band saw machine (Schedule 8207) for Anacostia, Washington, yard; one electric portable belt sander (Schedule 8192), watertube boilers and spare parts (Schedule 8184) for Eastern and Western yards; one motor-driven exhaust fan, seven blast gates and one dust-collector (Schedule 8219) for Quantico, Va., Naval Station; until July 7, electric storage batteries (Schedule 8220) for Philadelphia and Puget Sound yards; five pairs steel rolling type airplane hangar doors, with electrical parts, tools, etc. (Schedule 8206), f.o.b. works.

SOUTH ATLANTIC

China Tung Oil Co., Inc., Gainesville, Fla., H. W. Bennett, president, plans new one-story oil extraction mill at Brooker, Fla. Cost close to $55,000 with machinery.

Contracting Officer, Quartermaster Corps, Fort Benning, Ga., asks bids until June 30 for one 20,000-lb. electric-operated hydraulic lift (Circular 142).

H. T. Shore, 1301 Montgomery Street, Savannah, Ga., is at head of project to build a new meat-packing plant on Telfair Road, adjoining abattoir of J. T. Horney Live Stock Market, J. T. Horney, head, which is identified with enterprise. Plant will comprise three one-story units, for which superstructure will begin at once. Cost over $100,000 with equipment.

Purchasing and Contracting Officer, Quartermaster Office, Atlanta, Ga., asks bids until June 29 for galvanized conduit, cable connectors, lock-nuts, bushings, wood screws, plug fuses, solder lugs, switches, insulators and other electrical equipment (Circular 50).

SOUTH CENTRAL

Gray & Dudley Co., Avenue N and Clinton Road, Nashville, Tenn., manufacturer of stoves, ranges, parts, etc., has let general contract to Foster & Creighton Co., American National Bank Building, for one-story addition. Present enameling shop at Tenth Avenue and Union Street will be removed to new location and additional equipment installed. Cost about $55,000 with equipment.

United States Engineer Office, Vicksburg, Miss., asks bids until July 7 for two screw conveyer units for handling bulk Portland cement in storage barges (Circular 322).

United Collieries, Inc., Carew Tower, Cincinnati, plans new coal terminal and distributing plant on Ohio River at Cattlesburg, Ky., including dock and harbor facilities, steel tipple, conveyers, loaders and other facilities. Cost over $400,000 with machinery.

Director of Purchases, Tennessee Valley Authority, Knoxville, Tenn., asks bids until July 3 for permanent steel lock gates for Guntersville, Ala., lock.

Trumbull Electric Mfg. Co., Ludlow, Ky., manufacturer of electrical switches, panelboards and kindred equipment, has let general contract to Austin Co., Cleveland, for one-story addition. Cost close to $50,000 with equipment. Cmpany headquarters are at Plainville, Conn.

SOUTHWEST

Board of Public Works, Municipal Utilities Department, Marshall, Mo., L. B. Tracy, president, asks bids until June 29 for extensions nad improvements in municipal electric power plant, including one 1500-kw. turbo-generator with accessories, steam condenser unit, high-pressure boiler with stoker and fuel economizer, electric storage battery and charging equipment, combustion control equipment, switchboard and accessories, coal-handling machinery, overhead crane and hoist. Fund of about $215,000 has been arranged. Henrici-Lowry Engineering Co., 114 West Tenth Street, Kansas City, Mo., is consulting engineer.

Sterling Machinery Corp., 411 Southwest Boulevard, Kansas City, Mo., manufacturer of air compressors, pumps and kindred equipment, has acquired a two-story building on adjoining site and will remodel for expansion. One-story unit will be erected to connect both structures. Cost over $45,000 with equipment.

Waldorf Corp., 1522 Olive Street, St. Louis, wholesale liquor distributer, has leased four-story building at Olive and Sixteenth Streets, for new storage and distributing plant.

McClintic Grinding & Corrugating Works, 2519-21 Southwest Boulevard, Kansas City, Mo., has begun erection of new one-story heat-treating and machine shop, 50 x 65 feet. Cost about $40,000 with machinery.

Common Council, St. Francis, Kan., plans extensions and improvements in municipal electric power plant, including new diesel engine unit and accessory equipment. Cost close to $90,000. E. T. Archer & Co., New England Building, Kansas City, Mo., are consulting engineers.

Dart Truck Co., Twenty-seventh and Oak Streets, Kansas City, Mo., manufacturer of motor trucks and parts, has acquired adjoining property for two-story addition, superstructure to begin early in fall. Cost about $45,000 with equipment. Robert J. Raney, Union Station Building, is architect.

City Council, Temple, Texas, has plans for new municipal electric light and power plant and distributing system. Cost close to $800,000. Financing will be arranged through Federal aid. Garrett Engineering Co., Houston, Texas, is consulting engineer.

WESTERN PA. DIST.

Meadville Distillery Co., Inc., Meadville, Pa., has plans for additions and modernization in present distillery, near State Highway 98, comprising a new three-story unit, 80 x 100 ft., for mechanical-bottling and kindred service; new grain elevator, 30 x 60 ft.; and eight-story storage and distributing building, 80 x 120 ft. Cost over $250,000 with machinery. F. F. Bollinger Co., Ambridge, Pa., is engineer.

Clarksburg Water Board, Clarksburg, W. Va., S. G. Highland, secretary and general manager, asks bids until July 6 for two gas engine-driven centrifugal pumping units, each with capacity of 4,000,000 gal. per day, and complete accessories for municipal pumping station. Fuller & McClintock, 11 Park Place, New York, are consulting engineers.

Erie Resistor Corp., 644 West Twelfth Street, Erie, Pa., manufacturer of electrical equipment, parts, etc., will begin superstructure for three-story addition, 56 x 85 ft. Cost about $60,000 with equipment.

OHIO AND INDIANA

Meriam Co., 1955 West 112th Street, Cleveland, manufacturer of flow meters, gages and kindred measuring instruments, has let general contract to Truscon Steel Co. for one-story addition for a machine shop, storage and distribution. Cost close to $30,000 with equipment.

City Council, St. Clairville, Ohio, plans new municipal electric power plant. Fund of about $115,000 is being arranged for building and equipment. C. B. Bradfield, mayor, is at head of project.

Defiance Pressed Steel Co., Defiance, Ohio, plans rebuilding part of plant recently destroyed by fire. Loss over $600,000 with equipment.

United Engineering & Foundry Co., Wooster, Ohio, manufacturer of rolling mill machinery, transmission equipment, etc., has approved plans for improvements in plant, including new equipment. Cost about $125,000. Company headquarters are in Pittsburgh. Wooster property was acquired a few months ago for new branch works.

Cleveland Twist Drill Co., 1242 East Forty-ninth Street, Cleveland, plans one-story addition on adjoining site, 300 x 330 ft., acquired some time ago. Architect is being selected.

Pet Milk Co., Arcade Building, St. Louis, processed milk products, plans new one and two-story plant at Coldwater, Ohio, with power house and other mechanical units. Cost over $200,000 with machinery. Helfensteller, Hirsch & Watson, Chemical Building, St. Louis, are architects.

Logansport Machine Co., Logansport, Ind., manufacturer of presses, chucks, valves, etc., will begin superstructure for one and two-story addition, 60 x 200 ft., and 60 x 60 ft., for which general contract was let recently to Truscon Steel Co. Cost over $70,000 with equipment.

Contracting Officer, Quartermaster Corps, Jeffersonville, Ind., asks bids until July 6 for one ⅜-yard gasoline-driven power shovel, mounted on truck (Circular 313).

C. & G. Foundry & Pattern Works, 1026 Kentucky Avenue, Indianapolis, manufacturer of aluminum, brass, bronze and other metal castings, has let general contract to George I. Kegg, 4319 East Thirtieth Street, for new one-story foundry addition, about 6000 sq. ft. floor space, to be equipped for small metal-alloy castings, using present foundry unit for larger casting production. Charles J. Gisler is president.

S. M. Jones Co., Toledo, oil well supply manufacturer, has awarded contracts totaling $150,000 for plant modernization. Plans consist largely of new equipment to replace obsolete machinery, with some additional building.

MICHIGAN DISTRICT

Kraft Brewing Co., 1800 East Forest Street, Detroit, plans extensions and improvements, including new equipment. Company is carrying out new financing to total about $260,000, considerable part of fund to be used for expansion. Jean C. Stuhr is president.

United Stove Co., Ypsilanti, Mich., has plans for one-story addition, 80 x 250 ft. Cost over $100,000 with equipment. R. S. Gerganoff, Ypsilanti, is architect.

AC Spark Plug Co., Flint, Mich., has approved plans for one-story addition, 200 x 300 ft. Cost close to $150,000 with equipment.

Wolverine Brass Works, Grand Rapids, Mich., has filed plans for one-story addition, for expansion in foundry. General contract was let recently to I. K. Parsons & Sons, Grand Rapids. Cost over $40,000 with equipment.

American Forging & Socket Co., Pontiac, Mich., manufacturer of drop forgings, metal stampings, etc., has asked bids on general contract for one-story addition, 160 x 255 ft. Cost over $175,000 with equipment. L. J. Heenan, Pontiac, is architect.

Bosch Brewing Co., Houghton, Mich., plans new factory branch, storage and distributing plant, at Menominee, Mich. Cost about $45,000 with mechanical-handling and other equipment.

MIDDLE WEST

Pheoll Mfg. Co., 5700 West Roosevelt Road, Chicago, manufacturer of bolts, nuts, rivets, studs, etc., has plans for one-story addition. Cost close to $100,000 with equipment. Alfred S. Alschuler, 28 East Jackson Boulevard, is architect.

Acme Industrial Co., 413 North Carpenter Street, Chicago, manufacturer of die-maker's equipment and supplies, has let general contract to Lionel H. Uhlmann, 130 North Wells Street, for new one-story plant at Union and Lake Streets, 150 x 150 ft., with foundations for two additional stories later. Cost about $100,000 with equipment. Company will remove present factory to new location. Alfred S. Alschuler, 28 East Jackson Boulevard, is architect.

City Council, Iowa City, Iowa, plans construction of new municipal electric light and power plant, and distributing system. Cost about $915,000. Financing has been arranged through Federal aid. Burns & McDonnell Engineering Co., 107 West Linwood Boulevard, Kansas City, Mo., is consulting engineer.

Knife River Mining Co., Bismarck, N. D., plans rebuilding tipple at coal-mining properties at Beulah, N. D., recently destroyed by fire. Loss about $65,000 with equipment. M. C. Blackston is general manager.

United States Gypsum Co., 300 West Adams Street, Chicago, has let general contract to James Leck Co., 211 South Eleventh Street, Minneapolis, Minn., for new one-story plant at Heath, Mont., 58 x 420 ft., with storage and distributing division. Cost over $100,000 with equipment.

Chevrolet Motor Co., 3044 West Grand Boulevard, Detroit, has asked bids on general contract for one-story addition to branch assembling works at Janesville, Wis., 120 x 710 ft., to be occupied primarily by Fisher Body division, affiliated interest. Cost over $400,000 with equipment. Albert Kahn, Inc., New Center Building, Detroit, is architect and engineer.

Allis-Chalmers Mfg. Co., Milwaukee, has increased its appropriation of approximately $1,000,000 for enlargement of its tractor works at Springfield, Ill., by an additional $500,000 for enlarging capacity of farm and other light type tractor works at main plant in West Allis. Both projects are expected to be completed this year. H. C. Merritt is general manager of tractor division.

Milwaukee Sewerage Commission, Jones Island, closes bids July 2 for one 40-ton mechanical feed and stoker type incinerator, including pre-heater, at sewage treatment plant.

Line Material Co., South Milwaukee, will proceed with plans for proposed transformer shop, 60 x 138 ft., two and three stories, costing $90,000 to $100,000, now that City Council has agreed to vacate dead end street between present buildings as site for addition. William D. Kyle is president and general manager.

PACIFIC COAST

Spreckels Sugar Co., 2 Pine Street, San Francisco, will ask bids early in July for new beet sugar mill as Spreckels, a new townsite near Woodland, Yolo County, Cal., comprising main two and three-story refinery, storage and distributing buildings with air-conditioning installation, power house, pumping plant and other units. Cost about $1,500,000 with machinery. George Kelham, 315 Montgomery Street, San Francisco, is architect. C. J. Moroney is general manager.

Twentieth Century-Fox Film Studio, 10260 Orton Avenue, West Los Angeles, will ask bids soon for new power house, 82 x 110 ft. Cost about $75,000 with equipment. J. A. Barlow, address noted, is company engineer.

Bureau of Supplies and Accounts, Navy Department, Washington, asks bids until July 10 for nickel-steel die lock chain for Mare Island, San Francisco and other navy yards (Schedule 8208).

H. Moffat Co., Third and Arthur Streets, San Francisco, meat packer, has asked bids on general contract for new one-story and basement plant, 75 x 145 ft. Cost close to $60,000 with equipment. James Smith, 251 Kearny Street, is engineer.

Bohemian Breweries, Inc., Second and Walnut Street, Spokane, Wash., has approved plans for one-story mechanical-bottling unit, 50 x 85 ft. Cost about $40,000 with equipment. Edwin F. Theis is vice-president.

Bureau of Reclamation, Washington, asks bids until June 29 for one 125-ft. continuous tapered steel flagpole, with accessories, for Boulder Dam (Specifications 805-D).

California Spray Chemical Co., Richmond, Cal., manufacturer of industrial and agricultural chemical products, has approved plans for erection of new plant on 13-acre tract, recently acquired, comprising main manufacturing unit and smaller structures. Cost about $120,000 with equipment. Stone & Webster, Russ Building, San Francisco, are engineers.

Pacific Can Co., Williams and Newhall Streets, San Francisco, has let general contract to Jacks & Irvine, 620 Market Street, for one-story addition. Cost close to $40,000 with equipment. Hyman & Appleton, 68 Post Street, are architects.

Columbia Fruit & Distillery Co., Salem, Ore., has let general contract to H. G. Carl, Salem, for initial unit of new distillery, three-stories, 22 x 50 ft. Other units will be built soon. Entire project will cost about $65,000. Company has acquired property at 501 South Fourteenth Street.

FOREIGN

Associated Paper & Pulp Mills, Ltd., H. Brain, Collins House, Melbourne, Australia, secretary, recently organized with capital of $15,000,000, will take bids soon for new pulp and paper mill at Burnie, Tasmania, for production of writing paper and kindred paper stocks. Plant will include seven or more one and multi-story units, paper machine buildings, power house, pumping station, storage and distributing buildings and other structures. Company has arranged immediate financing to total $6,000,000, considerable part of proceeds to be used for new mill and development of timber properties for pulp wood supply. Assets of Tasmanian Paper Pty., Ltd., will be acquired, including concessions for property at Kermandie, Tasmania. Amalgamated Zinc Co., Ltd., and Electrolytic Zinc Co., Ltd., Melbourne, are interested in project.

Israel Newton & Sons, Ltd., Summerley Works, Bradford, England, manufacturer of boilers, tanks and other plate products, plans addition, including foundry unit, for production of castings and other iron products. Cost over $200,000 with equipment.

TRADE NOTES

Lindberg Engineering Co., Chicago, announces the opening of a Detroit office at 7338 Woodward Avenue.

Iron & Steel Products, Inc., Chicago, dealer in railway supplies and equipment, has purchased the north works of the Ryan Car Co., located in Hegewisch, Ill. The purchase consists of all of the buildings and about 27 acres of land.

Robins Conveying Belt Co., New York, has made a sales agreement with Mine & Smelter Supply Co., Denver, Salt Lake City and El Paso, Tex., for the sale of Robins equipment in Arizona, Colorado, Montana, New Mexico, Utah, and Wyoming and in parts of Idaho, Nebraska, South Dakota, and Texas.

The Carborundum Co., Perth Amboy, N. J., has released a unique motion picture film, entitled "Super-Refractories through the Microscope," developed by the research laboratories of the company. The first part of the film was made by the kodachrome process, and shows the structure of various refractory materials as they are revolved on the stage of the polarizing microscope. The second part of the film was made by means of the newly developed thermal microscope and gives a graphic demonstration of the actual behavior of various types of refractories under severe operating conditions. The first public showing of the film was given at the convention of the American Ceramic Society in March.

Brooklyn Bolt & Nut Co., 1087 Atlantic Avenue, Brooklyn, announces a complete stock of bolts, nuts, screws, washers, cotter pins, rivets, small tools, etc.

The Charles Horewitz Estate, formerly affiliated with the Butler Iron & Steel Co., is now engaged in business under the name of Charles Horewitz' Sons, 334 East Cunningham Street, Butler, Pa. The company will deal in iron and steel scrap, metals, waste materials and a complete line of welding and cutting equipment.

All-Steel-Equip Co., Aurora, Ill., has opened branch office at 311 Donovan Building, Detroit, with H. L. Breitenstein as district manager.

Electrol, Inc., manufacturer of automatic oil burners and air conditioning equipment, was purchased June 1 by Morgan J. Hammers, Stamford, Conn., and associates.

Republic Steel Corp., Cleveland, has appointed W. L. Blake Co., Portland, Me., and Hunter & Havens, Bridgeport, Conn., as distributers of Toncan copper molybdenum iron sheets.

Michigan Tool Co., Detroit, has appointed Brammer Machine & Tool Service, 104 Tulsa Building, Tulsa, Okla., to handle its line of Mitco cutting tools, cemented tungsten carbide tools, Michigan gear finishing, lapping and checking equipment, etc., in Kansas, Oklahoma and northern Texas.

Oliver Bros., Inc., New York and Chicago, has moved its New York offices to 417-421 Canal Street and will occupy entire fifth floor at this address. Company is resident buyer for wholesale hardware, mill, automobile, electrical, radio and plumbers supply houses.

FINANCIAL NOTES

Acme Steel Co., Chicago, during the three months ended March 31, had net income of $391,853, equal to $1.19 a share on 328,801 shares of capital stock. This compares with $601,990, or $1.83 a share in the like 1935 period. Company's capital stock has been placed on a $3 annual basis.

Sharon Steel Corp., Sharon, Pa., has declared initial dividends on the $5 convertible preferred shares of the company. The declaration covers 12 days in March, the shares having been issued March 19. For this period of the first quarter the dividend was 18c. For the full second quarter ending June 30 the regular dividend of $1.25 was declared, making the total payment to the 40,000 shares of stock $1.43 per share. No action on the common stock was taken, although first half earnings of the company are likely to be several times the preferred dividend requirements.


WESTINGHOUSE
1886
1936
GOLDEN JUBILEE

50 YEARS

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DERRY, PA.
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EAST PITTSBURGH, PA.
Motors, generators, control equipment, railway equipment, switchboards and switching equipment, circuit breakers, arc welders

EAST SPRINGFIELD, MASS.
Fractional horsepower motors, air conditioning equipment, fans, refrigerating equipment, water coolers, vacuum cleaners

EMERYVILLE, CAL.
Porcelain insulators

HOMEWOOD, PA.
Repair and renewal parts

MANSFIELD, OHIO
Household appliances such as refrigerators, ranges, water heaters, dish washers, laundry equipment and table appliances

NEWARK, N. J.
Watthour meters, instruments and relays

PITTSBURGH, PA.
Nuttall gears, gear motors, speed reducers and trolleys

SHARON, PA.
Transformers

SOUTH PHILADELPHIA, PA.
Steam turbines, condensers, heat exchangers, Diesel engines

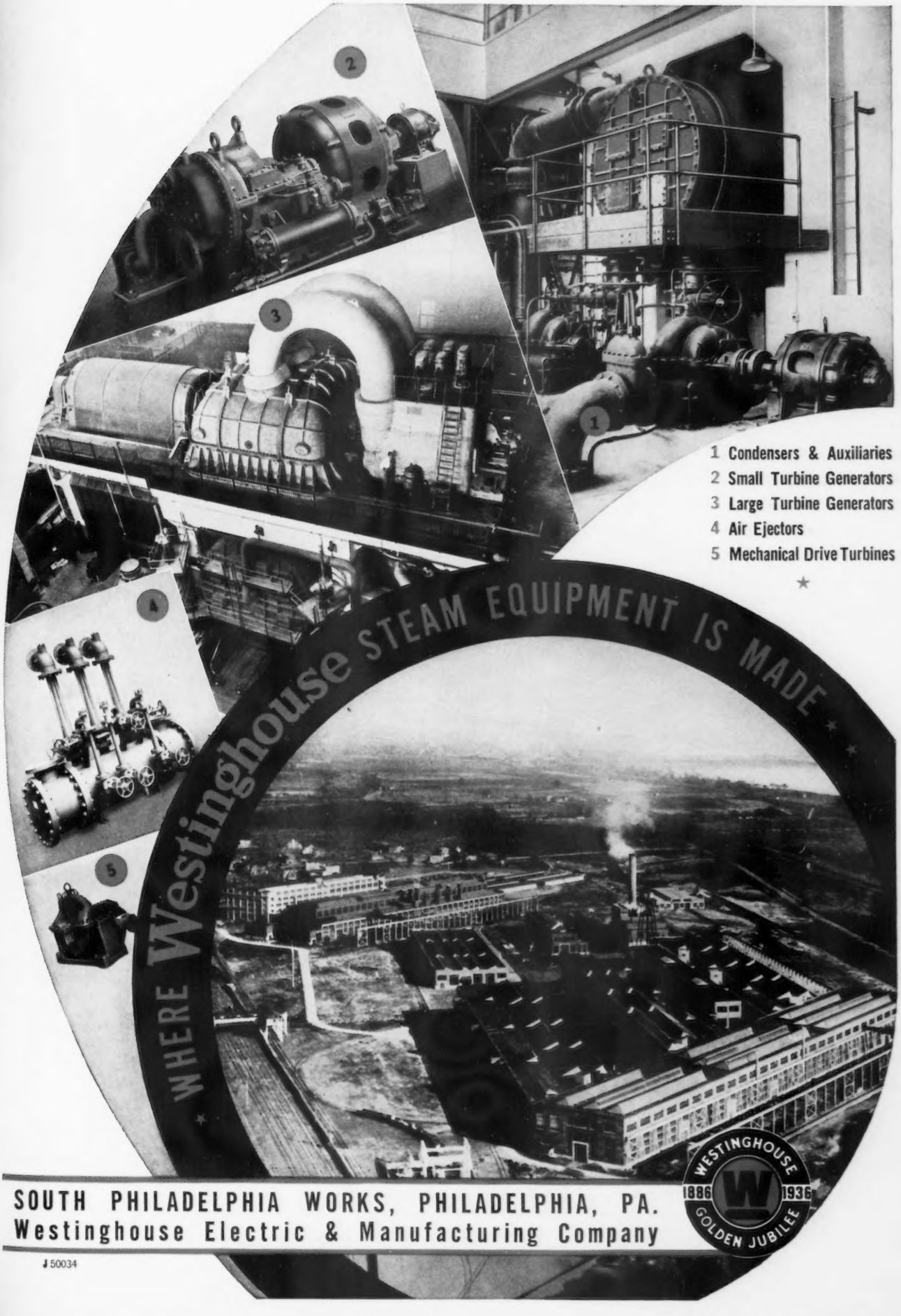
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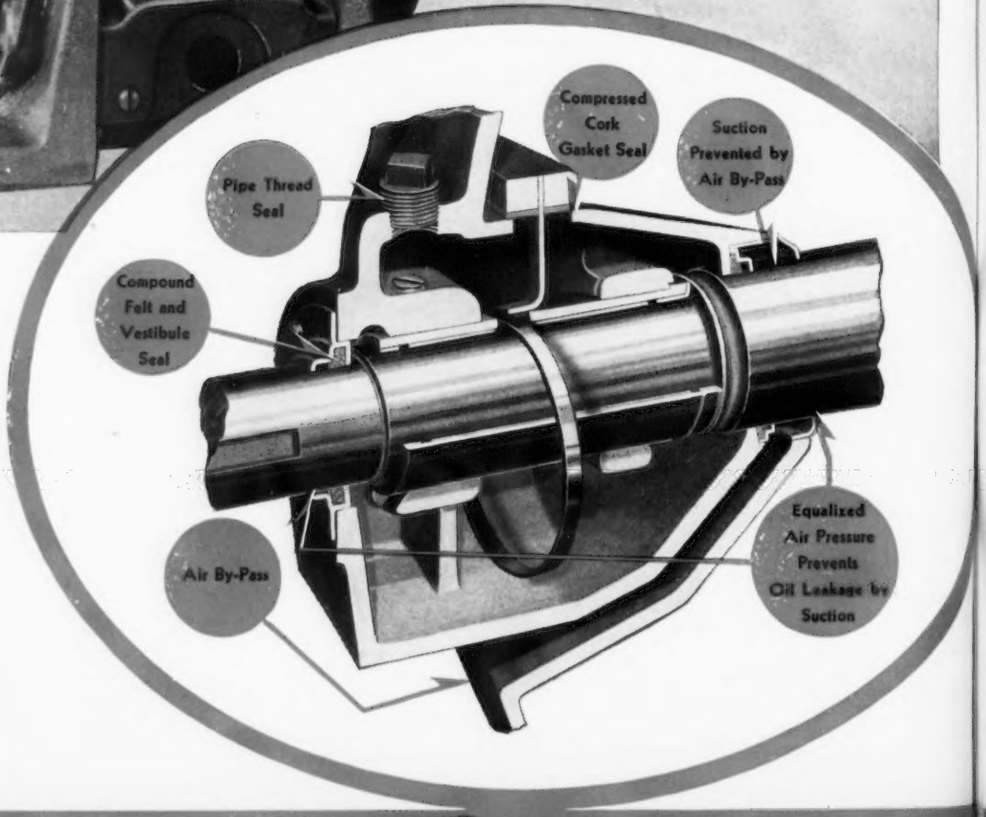
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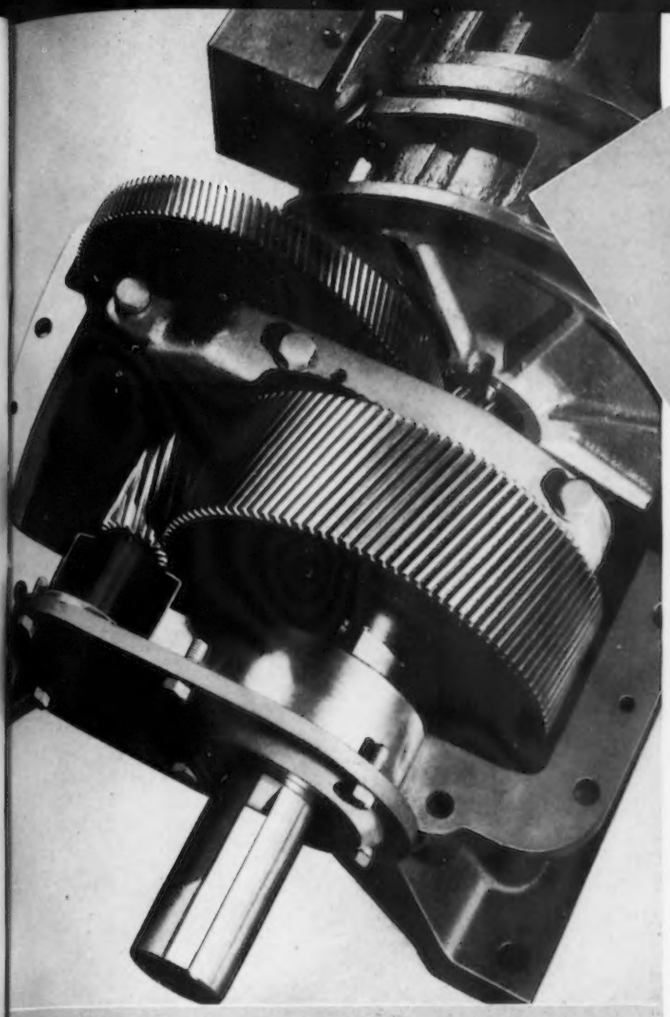
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Westinghouse

Golden Jubilee **WATER COOLERS**

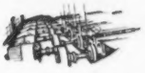


PLUS VALUE NO. 3

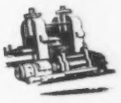
BPT "TOUGH-HARD" GEARS *stand up* IN TOUGH-HARD JOBS...



A set of Westinghouse heat-treated gears have run more than *a million miles* in street car service;



have made more than *3 billion revolutions* in a paper mill installation; have shown *no signs of wear* after 3 years



service in a copper strip mill.

THE exclusive BPT process imparts to Westinghouse gears, pinions and shafts tough-hard qualities that provide maximum load-carrying capacity and utmost resistance to wear and shock.

Space, weight and installation costs can be reduced with many types of gearmotors . . . but when you select Westinghouse gearmotors you get *plus* values, from the motor terminals to the slow speed shaft.

Check the plus values found in Westinghouse gearmotors when contemplating the purchase of slow speed drives. Get complete information from our representative or write Westinghouse Room 5-N, East Pittsburgh, Pennsylvania. R 65032

Check THESE PLUS VALUES

1. Built, designed, tested as a unit. 2. Motor and gearing parts are matched. 3. BPT heat treated gears, pinions and shafts. 4. Fewest moving and wearing parts. 5. Readily accessible for inspection or maintenance. 6. No sag or twist in motor frame. 7. Insulation protected mechanically and electrically. 8. Gears cut on shaft. 9. Positive oil seal. 10. Single helical gearing.

WESTINGHOUSE 1886 W 1936 GOLDEN JUBILEE

Westinghouse Gearmotors



The Westinghouse Attica, N. Y., Works is Devoted Exclusively to the Manufacture of Westinghouse Stokers.

★★ Westinghouse MULTIPLE AND SINGLE RETORT STOKERS

for Industrial, Central Station and Transportation Applications

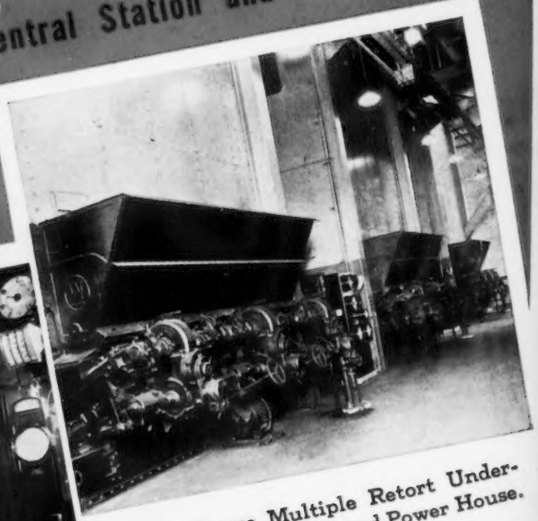
WESTINGHOUSE 1886 1936 GOLDEN JUBILEE



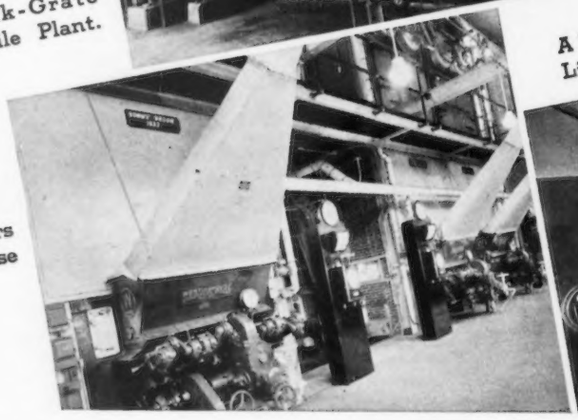
A Westinghouse Single Retort Stoker in a Yarn Mill.



A Westinghouse Continuous-Ash-Discharge Link-Grate Stoker in a Textile Plant.



Westinghouse Multiple Retort Underfeed Stokers in a Railroad Power House.



Westinghouse Stokers in the Boiler House of a Distillery.



A Westinghouse Continuous-Ash-Discharge Link-Grate Stoker in Industrial Service.

J 50033

New Britain Chuckers are producing for Westinghouse!

Presenting our Latest

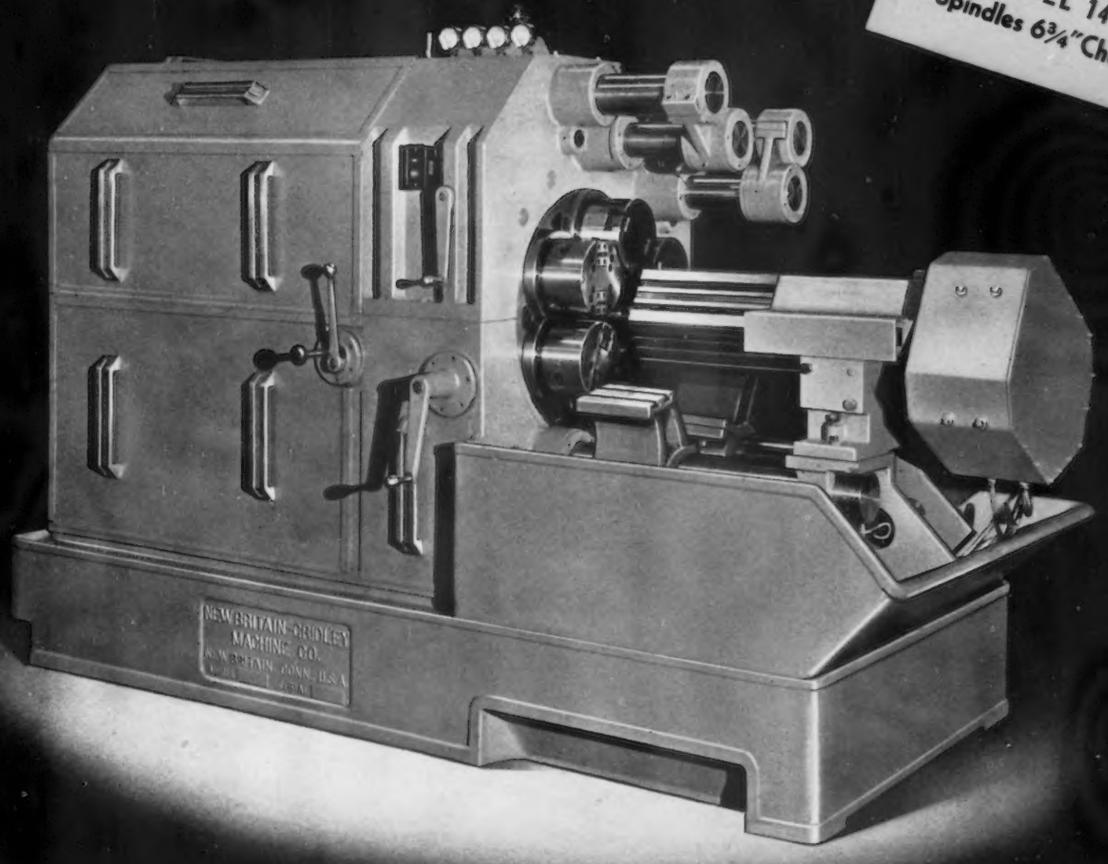
WORK ROTATING CHUCKER

Built to STAY *Accurate*

MODEL 675
6 Spindles 7½" Chucks

MODEL 49
4 Spindles 9" Chucks

MODEL 14
4 Spindles 6¾" Chucks



Also a complete new line of Automatic Screw Machines — 6 Spindles to 2¼" and 4 Spindles to 3" Capacity

THE NEW BRITAIN-GRIDLEY MACHINE COMPANY

NEW BRITAIN, CONNECTICUT, U.S.A.

VISUALIZING THE BIG PART PRATT & WHITNEY ACCURACY HAS PLAYED AT WESTINGHOUSE

WESTINGHOUSE 1886 W 1936 GOLDEN JUBILEE

Pratt & Whitney accuracy is known the world over. We are proud of the excellent reputation our machines and tools have earned, not only at Westinghouse but in all major shops.



This three-station Electrolimit Gage is guarding Westinghouse accuracy at East Springfield.

We are proud to have had a part in the important contributions Westinghouse has made to human progress.

Fifty years ago Westinghouse turned to Pratt & Whitney for the best in manufacturing equipment. The cordial relationships established then have never ceased. Pratt & Whitney congratulates Westinghouse on its completion of fifty worthwhile years.

On these four pages we have shown in picture form a few of the many ways Pratt & Whitney accuracy is at work in Westinghouse shops. Today, as in 1860, our standards of quality and craftsmanship are of the highest. If your needs include machine tools, small tools or gages, ask Pratt & Whitney.



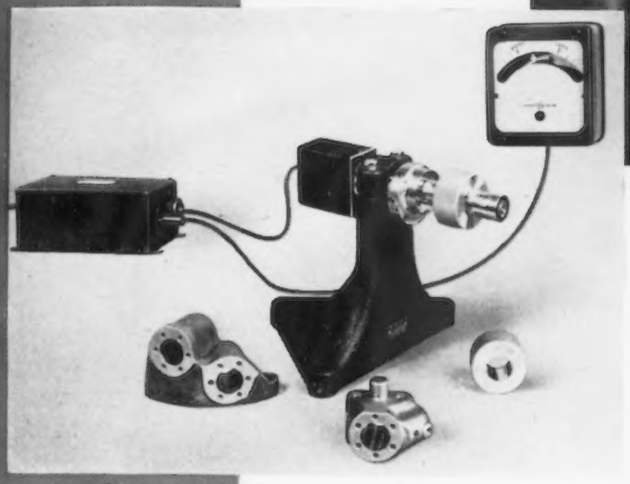
Pratt & Whitney Milling Cutters have their accurate part in Westinghouse production.



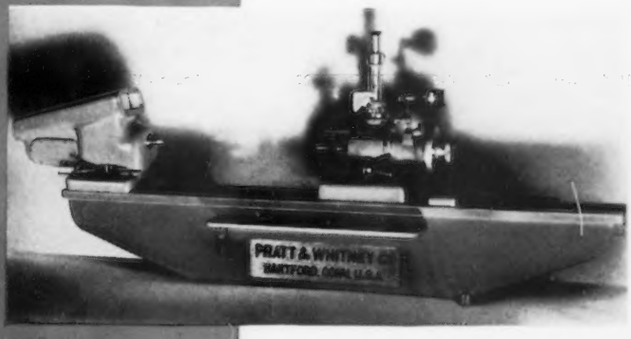
Dozens of P&W precision lathes like this one have been purchased by Westinghouse. These machines have established a reputation for accuracy, stamina and convenience. This particular one has been rendering excellent service for some time at East Springfield. Ask for our lathe literature.



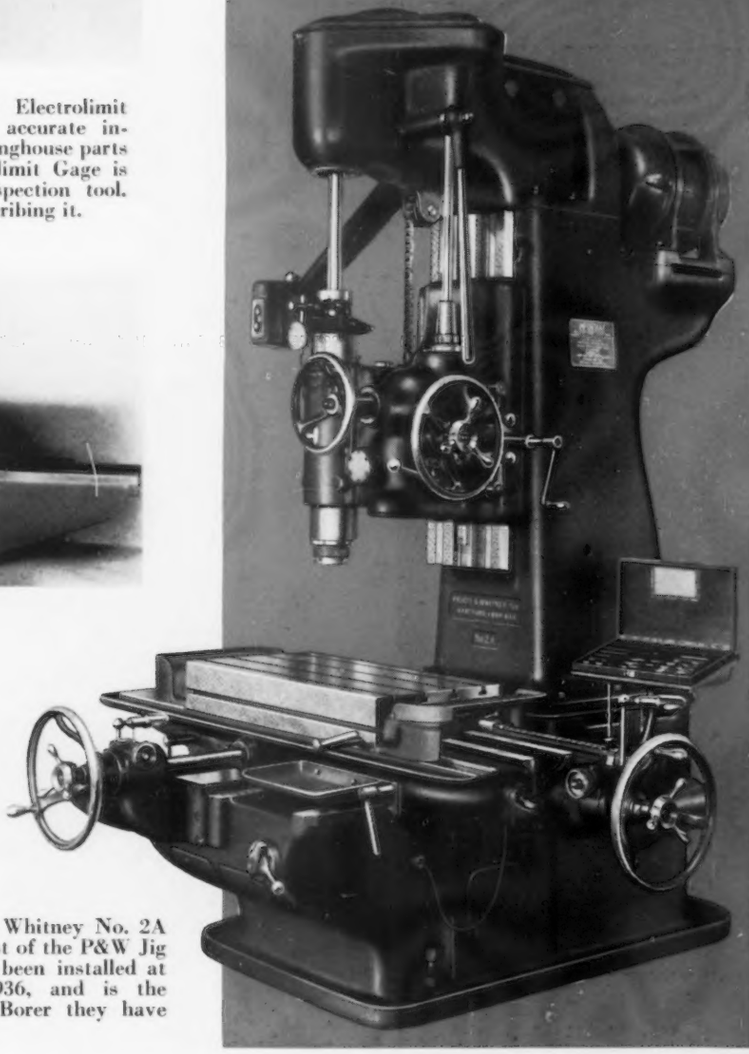
Surface grinding with P&W Grinder is a fast, accurate method of finishing a wide variety of work. This particular P&W Vertical Surface Grinder is in regular use at the South Philadelphia Westinghouse works. Complete literature is available.



This P&W internal Electrolimit Gage provides fast, accurate inspection for the Westinghouse parts shown. The Electrolimit Gage is industry's newest inspection tool. Ask for literature describing it.



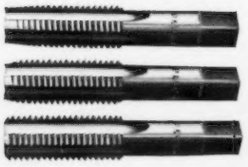
This is the P&W Standard Measuring machine, accurate to .00001". In Westinghouse laboratories it furnishes the means for fine measuring so essential in research.



This is the Pratt & Whitney No. 2A Jig Borer—the newest of the P&W Jig Borers. It has just been installed at Westinghouse in 1936, and is the fifteenth P&W Jig Borer they have purchased.



P&W Milling Cutters include all kinds. Ask for a Small Tool Catalog.

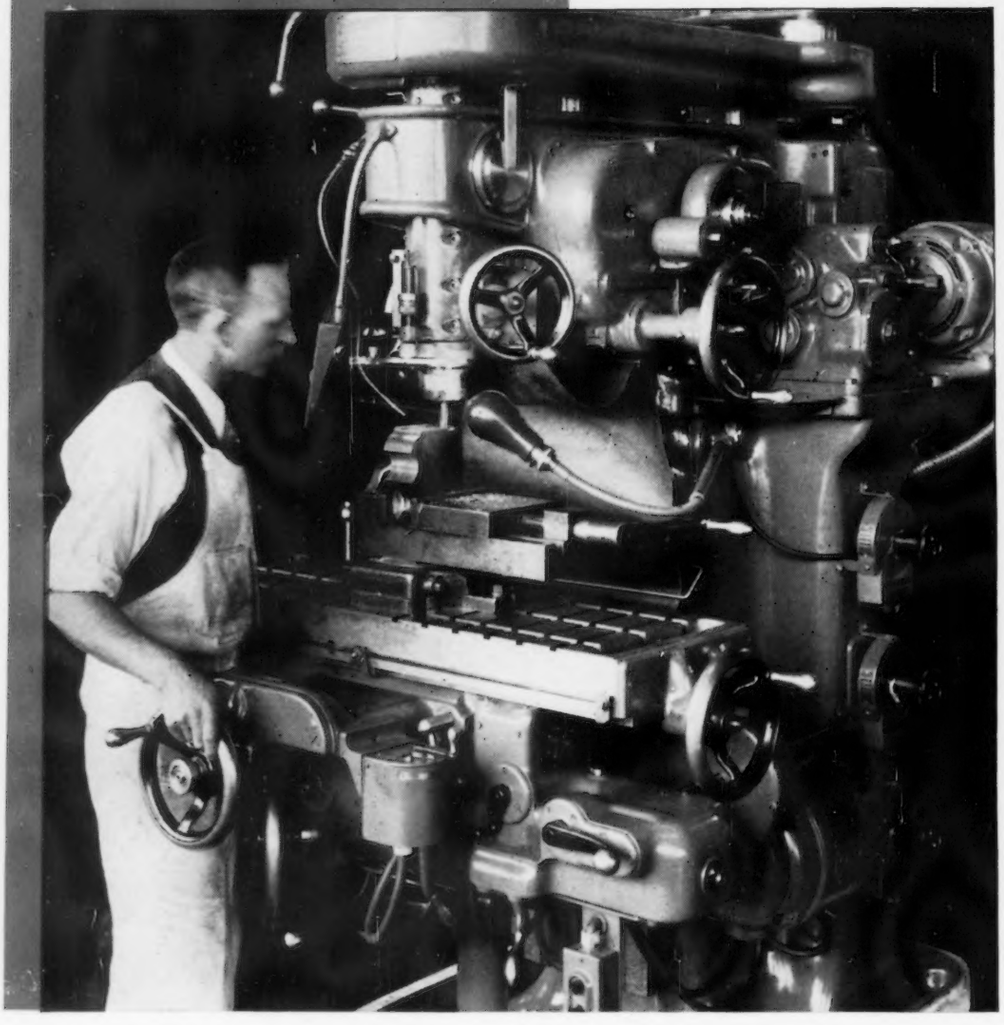


P&W taps have cut millions of Westinghouse threads.

Kellerflex equipment as shown below is typical of dozens of such flexible shaft machines used by Westinghouse. Keller Automatic Tool Room Machines do their part in die work and manufacturing.







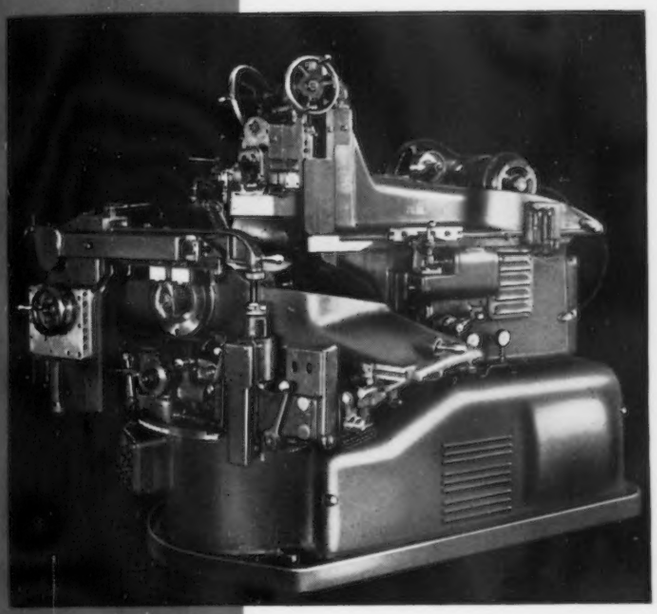


P&W John-Sons Roll Thread Snap Gages insure the accuracy of Westinghouse threads.

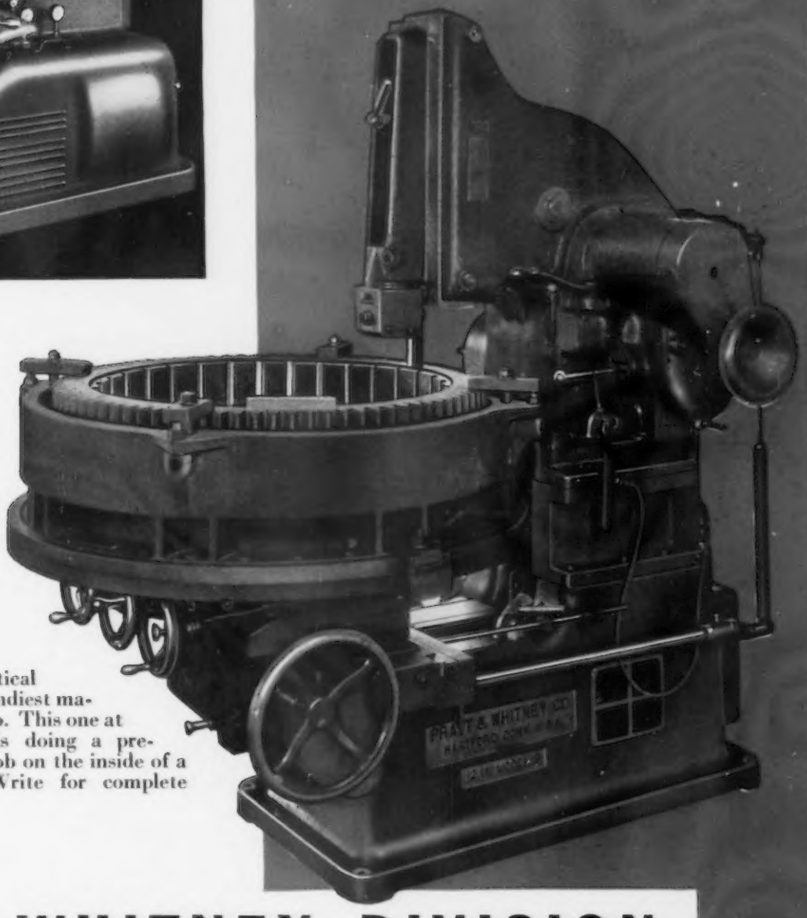
At the left is the new P&W No. 2A Universal Die Sinker just installed in the Westinghouse South Philadelphia works. It is to be used in the making of dies for forging turbine blades, and initial performances prove its usefulness and economy. Above this picture is a closeup of a typical P&W die sinking cutter designed for use in tough, modern die steels. Ask for literature on these new tools. They effect big production savings.



P&W Hoke Precision Gage Blocks are industry's master standards of length. Accurate within a few millionths of an inch, they are the basis upon which gages and measuring instruments are calibrated. Every shop needs a set for precision reference. Westinghouse uses them.



Gear tooth grinding, the modern way of producing accurate, quiet gears, is in use at Westinghouse. This is the P&W Hydraulic Gear Grinder for spur and helical gears that has made gear history. Ask for information.



The P&W Vertical Shaper is the handiest machine in the shop. This one at Westinghouse is doing a precision slotting job on the inside of a large gear. Write for complete literature.



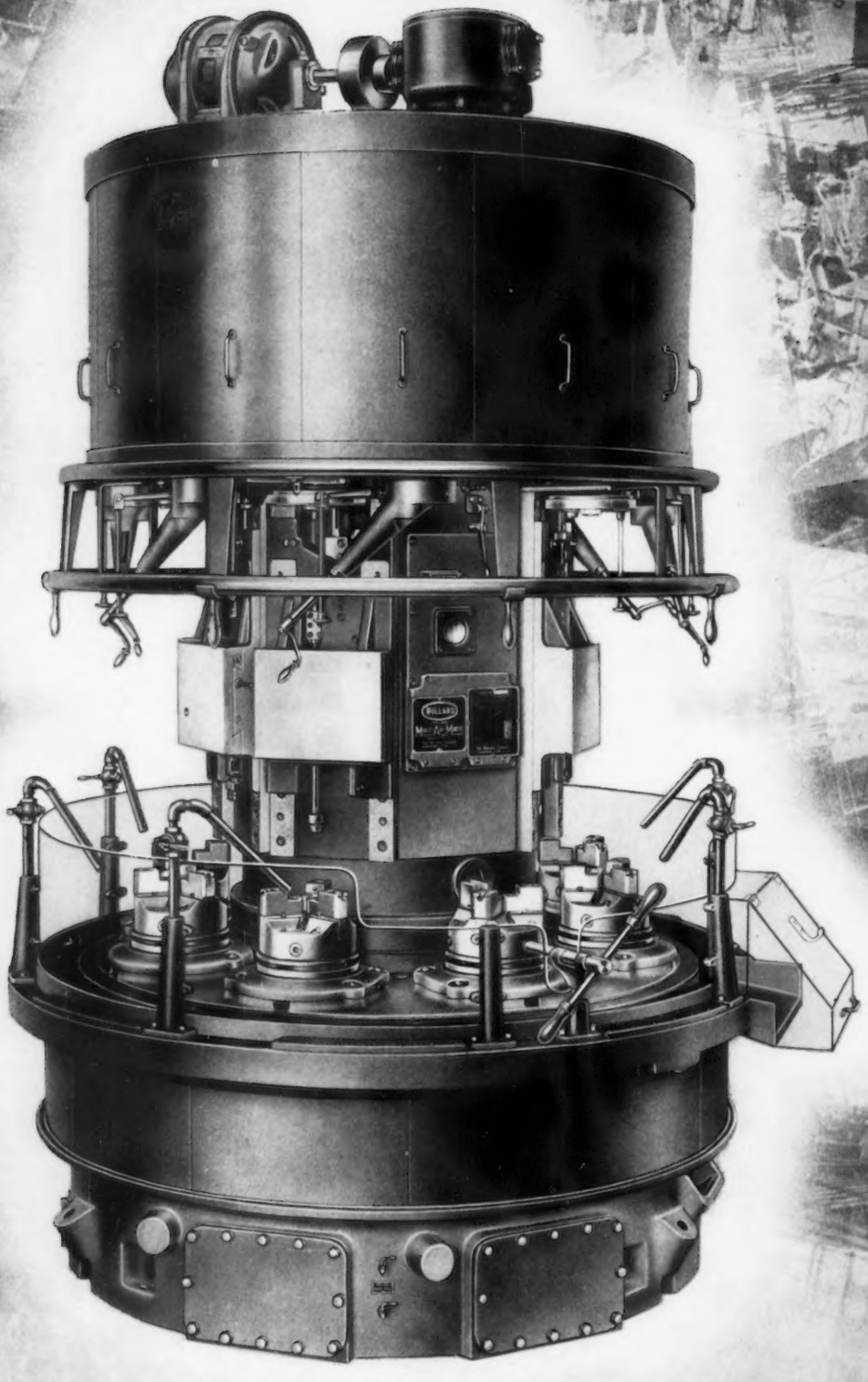
P&W Trusform Adjustable Limit Snap Gages.

PRATT & WHITNEY DIVISION

Niles-Bement-Pond Company

HARTFORD, CONN., U. S. A.

Branch Offices and Agencies:—BIRMINGHAM BOSTON CHICAGO CINCINNATI CLEVELAND DETROIT LOS ANGELES NEW YORK PHILADELPHIA PITTSBURGH ROCHESTER SAN FRANCISCO ST. LOUIS



8-Inch 8-Spindle Type "D" Mult-Au-Matic

Let Bullard Engineers tell you—What Mult-Au-Matics CAN DO for You.

Submit Prints for Samples for Estimates



WESTINGHOUSE
OUR CONGRATULATIONS
on your
GOLDEN ANNIVERSARY

As users of the Finest manufacturing Equipment, Westinghouse Products naturally inherit Quality and Acceptance the World over.

For years Bullard Machines – Mult-Au-Matics and Vertical Turret Lathes – have had their place in producing Westinghouse Products and building Prestige through Quality.

Their continued acceptance has proved their Ability to produce to the High Standards of Accuracy and to provide Profits which more than warrant the Investment.

THE BULLARD COMPANY

BRIDGEPORT, CONNECTICUT

CASE STUDY NO. 67

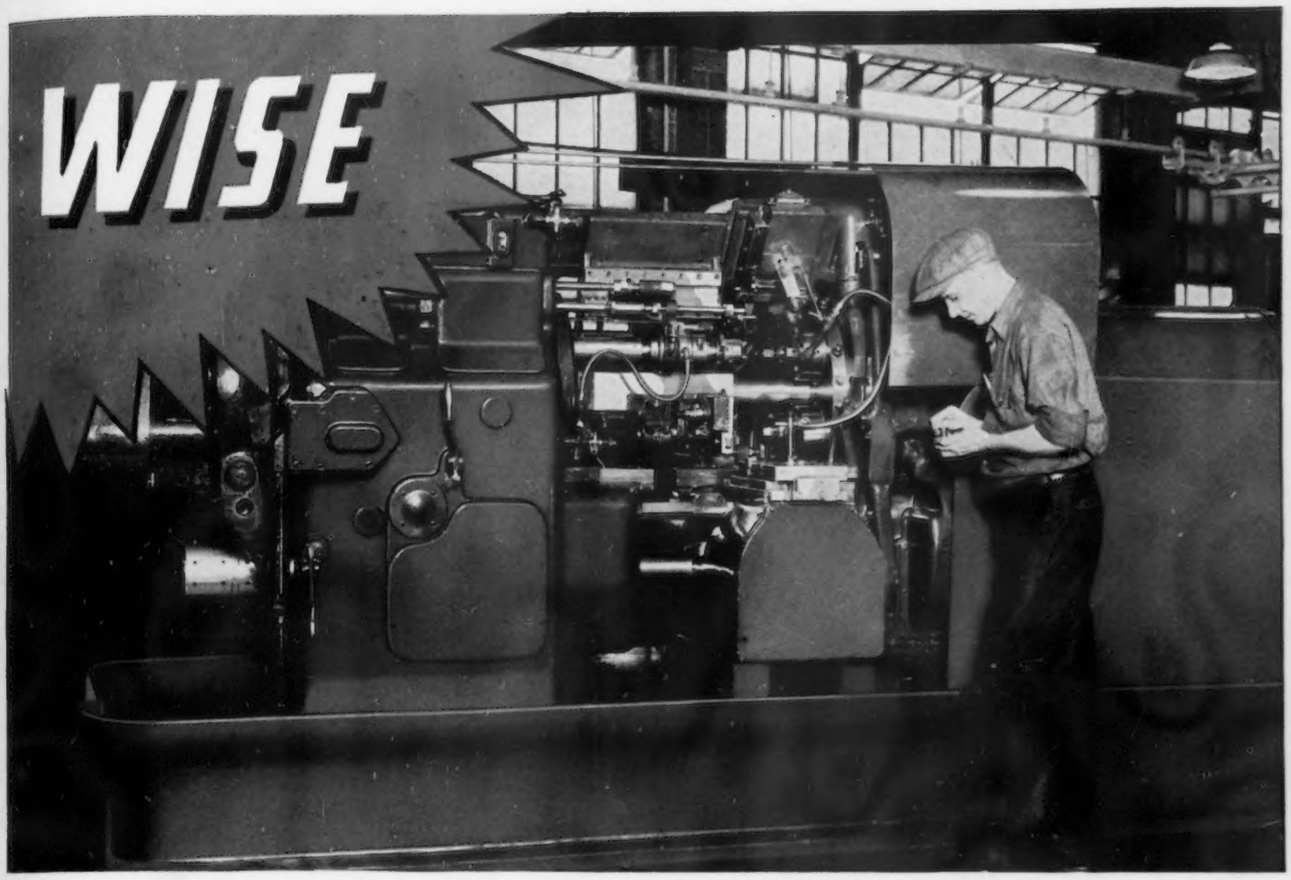
THE PROFIT-MODERNIZE



In Westinghouse plants at East Pittsburgh and at Springfield you will find many National Acme Circular Chaser Die Heads in use. The unique chaser construction provides more threads per grind, and many more grinds than old-fashioned chasers. It guarantees fast, accurate, close-to-the-shoulder threading —and it's unequaled for *long life*. Write for literature on this money-saving die head.

Automatic Screw Machines
Dies and Taps
Positive Centrifuges
The Chronolog
Contract Manufacturing

NATIONAL



How Westinghouse Steps Up Production with New Machines

PRODUCING over 3000 different parts with runs as high as 750,000 keeps the Westinghouse screw machine department filled to capacity month in, month out. Parts are of brass, copper, bronze and steel. Every job is different. Fast delivery is always the watchword.

National Acme Model R Gridley Automatics are used in both the Springfield and East Pittsburgh plants of the Westinghouse Electric and Manufacturing Company. These new type machines keep the production curve at a peak. They insure low cost, high-speed operation.

Amazing improvements have been made in screw machines within the last few years. Our 1936 model is heavier. Tooling is more accessible. Indexing is faster. Power is increased. Vibration and chatter are eliminated. The design is simplified so that every operation is speeded up.

As a result these machines frequently pay for themselves in less than a year. Why not follow the lead of Westinghouse? Modernize for profit. Write for complete information on our new machines.

The National Acme Company, *Cleveland, Ohio*

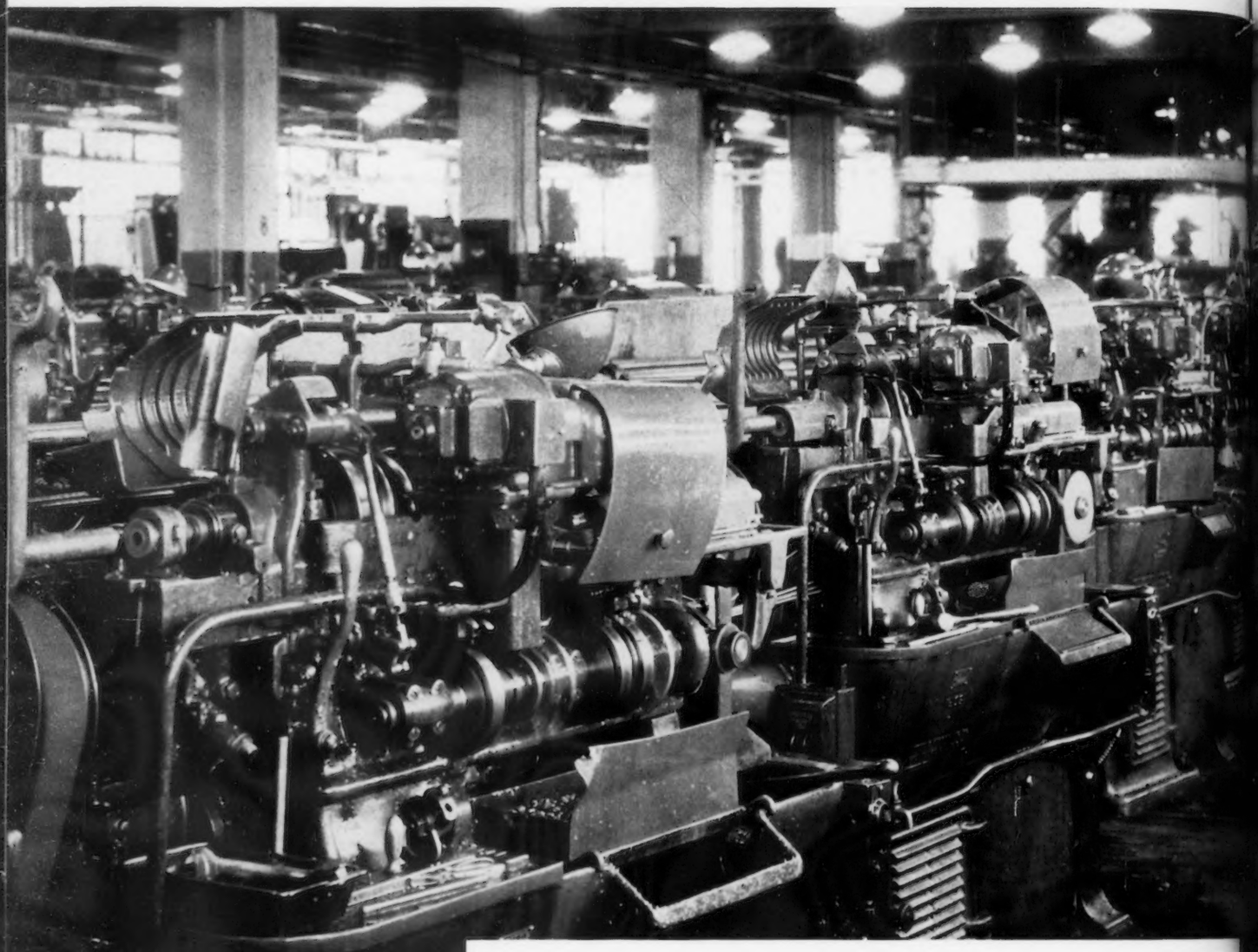
NATIONAL ACME CO.
REG. U.S. PAT. OFF.

PLOW IT BACK

If you have money to invest, there is no better place to invest it than in your own plant. Modernize for profit. National Acme Gridley Automatics are returning handsome dividends to dozens of large corporations which believe in plowing back part of their earnings. Would you like to have one of our engineers make a free survey of your screw products department?

ACME
GRIDLEY AUTOMATICS

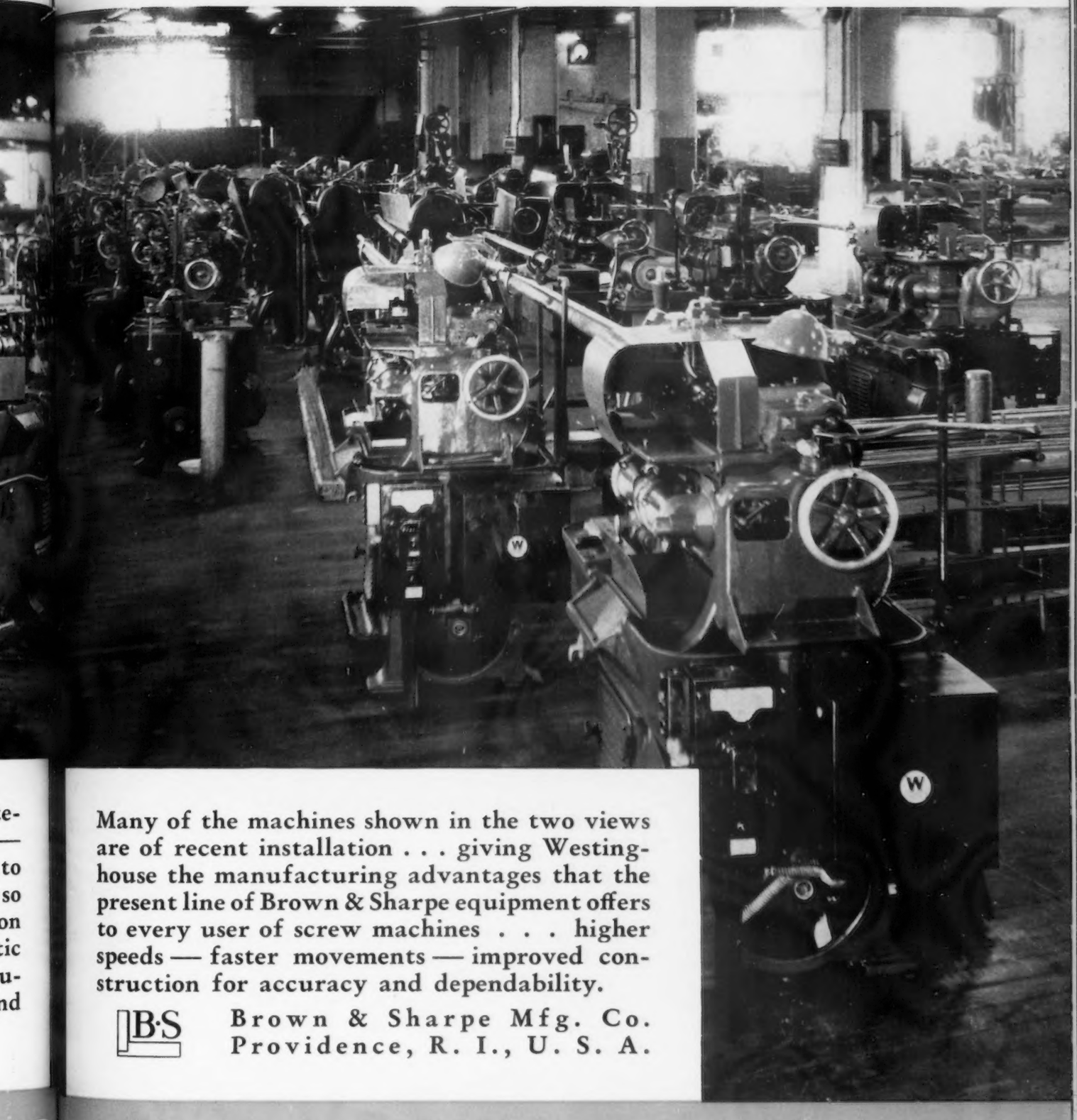
WESTINGHOUSE
Modern Automatic



Hundreds of different parts—numerous materials—varying degrees of finish and accuracy—large lots—small lots—production schedules to be maintained—and, cost to be kept low . . . so Westinghouse Electric and Mfg. Co. depends on these batteries of Brown & Sharpe Automatic Screw Machines to obtain economical manufacture of its many products for industry and the home.

BROWN &

relies on these Screw Machines



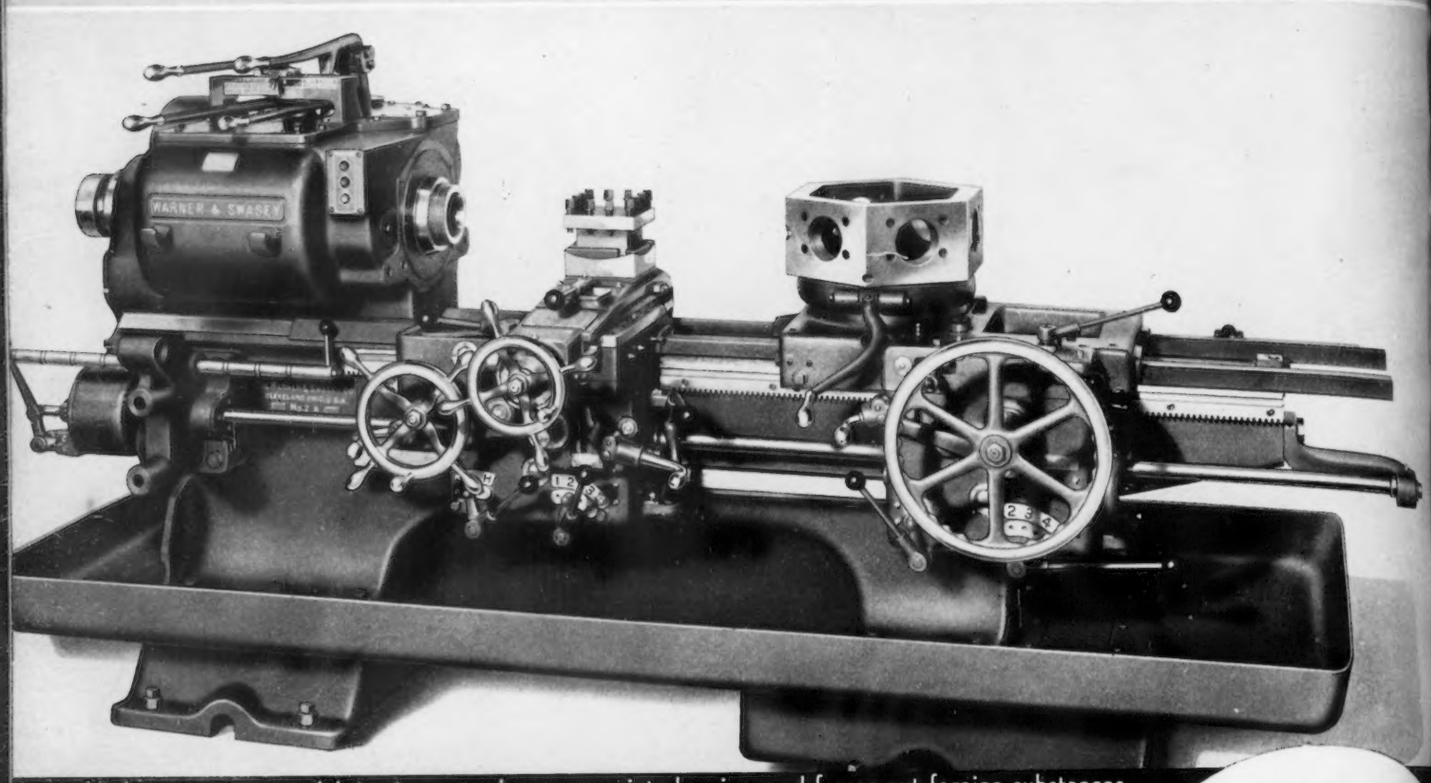
Many of the machines shown in the two views are of recent installation . . . giving Westinghouse the manufacturing advantages that the present line of Brown & Sharpe equipment offers to every user of screw machines . . . higher speeds — faster movements — improved construction for accuracy and dependability.

B·S Brown & Sharpe Mfg. Co.
Providence, R. I., U. S. A.

& SHARPE

NEW FEATURES

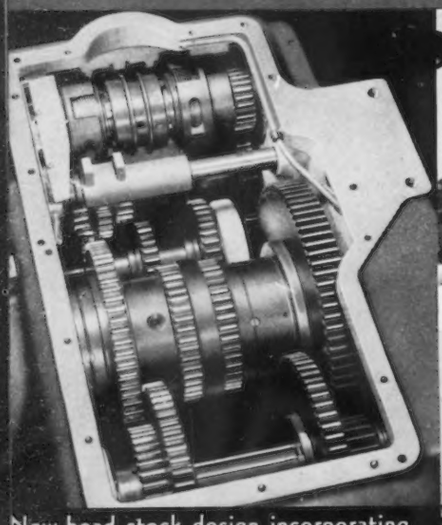
DESIGNED TO INCREASE YOUR EARNINGS



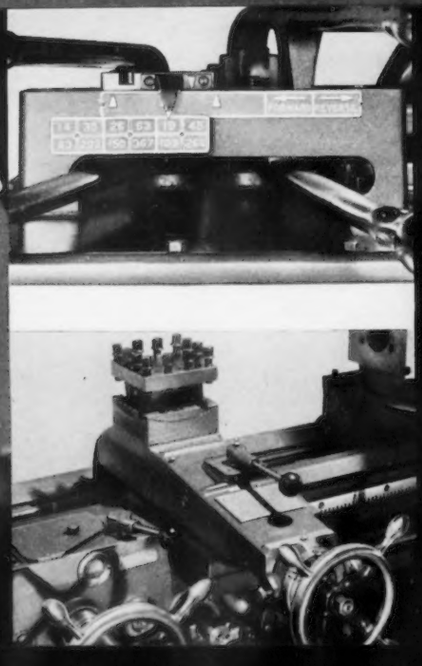
High pressure grease lubrication puts clean grease into bearings and forces out foreign substances and grit. All operating levers located for greater convenience and new ease in operation.

RECENT IMPROVEMENTS ON WARNER & SWASEY

"A" TYPE



New head stock design incorporating anti-friction bearings, ground gear teeth and correct lubrication permits up to 100% increase over standard speed with absolute safety.



New patented direct reading spindle speed indicator for quick shifting. All speed lever positions are shown directly without reference to charts.

Hardened steel square turret with internal circumference binder ring and remote control binder lever increase the utility and rigidity of the carriage unit.



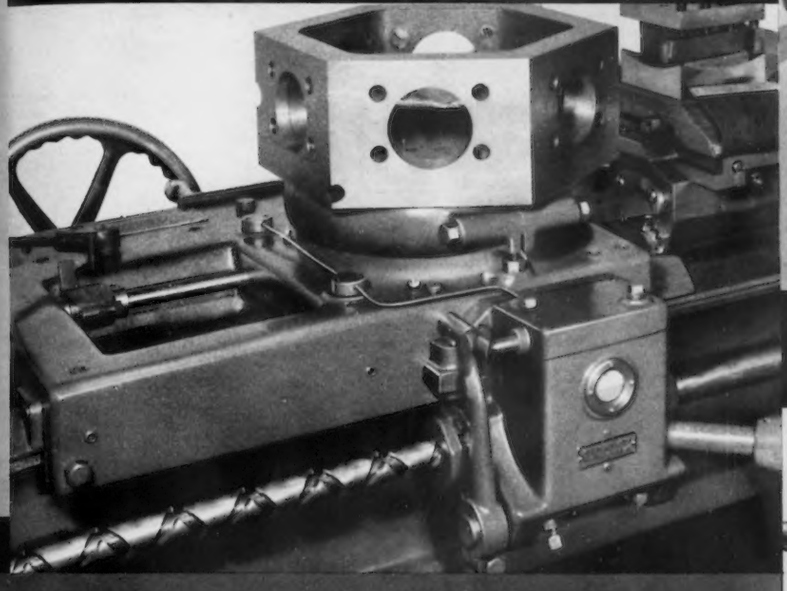
The new heavier hex turret mounted on a Timken tapered roller bearing provides increased rigidity for tool mounting and permanent accuracy.

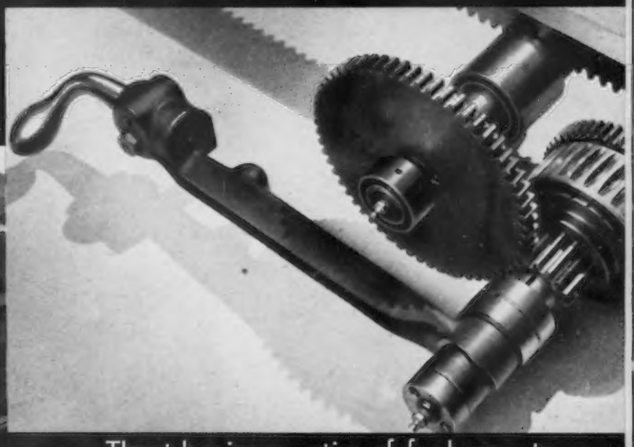


Two completely enclosed built-in oil pumps, one for the carriage and one for the saddle, automatically deliver clean filtered oil to the bedways. Warner & Swasey Patented "Way Covers" prevent washing away of the lubricant, protect the bedways from damage and preserve the initial accuracy of the machine.



New type easily adjusted stop dogs for the hex turret feed knockoff, greatly reduce set-up time.





Thrust bearing mounting of feed worm together with the anti-friction bearing mounting of rack pinion shaft, allows greater feeding pressures.



New built-in electrical push button control station adds convenience to ease of operation.

TURRET LATHES!

You are only interested in these new features if they will bring you increased earnings—We'll be glad to help you find out how this can be accomplished!

WARNER & SWASEY

Turret Lathes

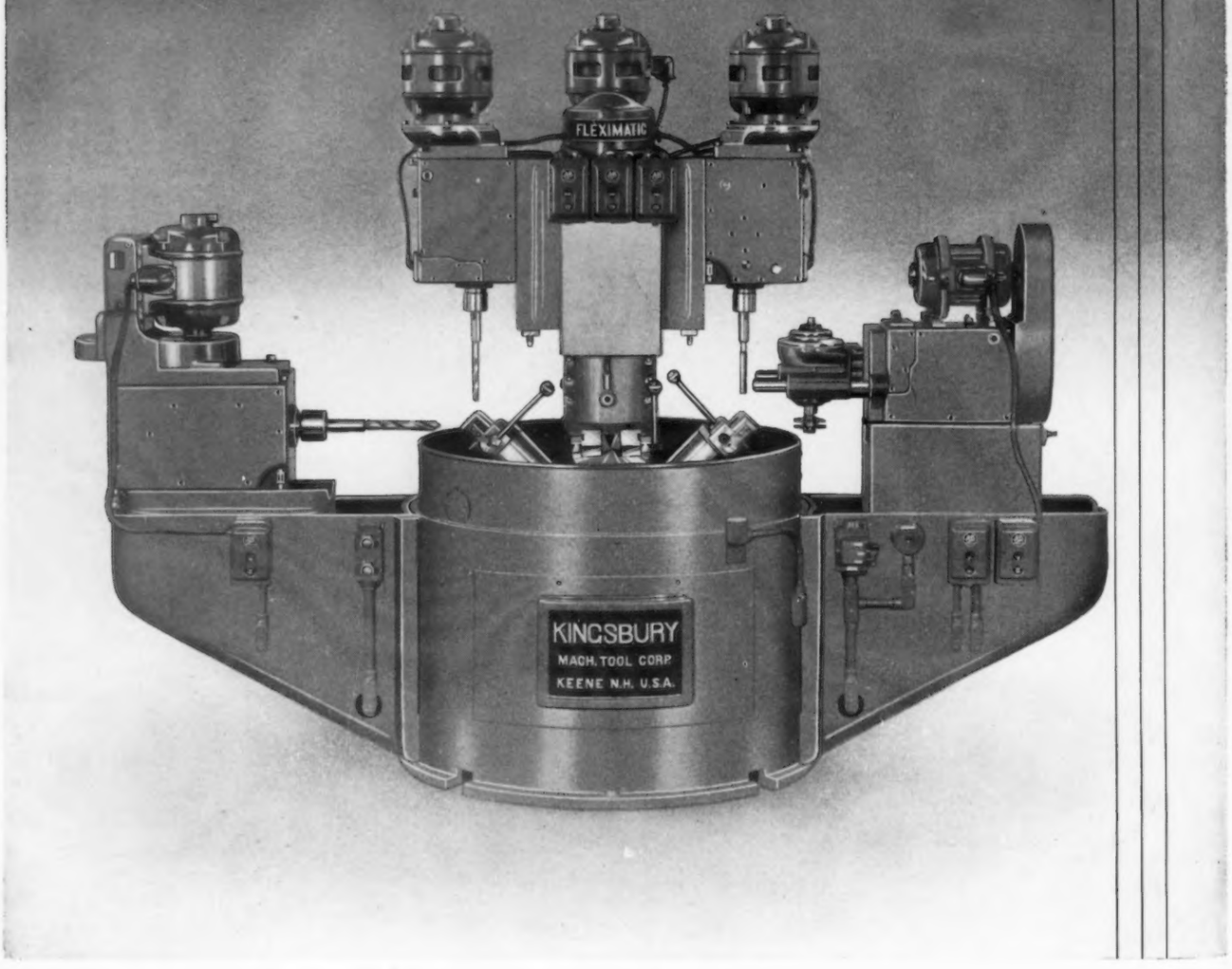
CLEVELAND



New square lock cross slide eliminates side-tilt tendency under heavy cuts. Hardened steel replaceable wear strips preserve initial accuracy.

The KINGSBURY FLEXIMATIC

DRILLS
TAPS
MILLS



AUTOMATIC DRILLING *by the* KINGSBURY METHOD

MODERN Production with its seasonal changes demands flexible equipment at no sacrifice in speed and accuracy.

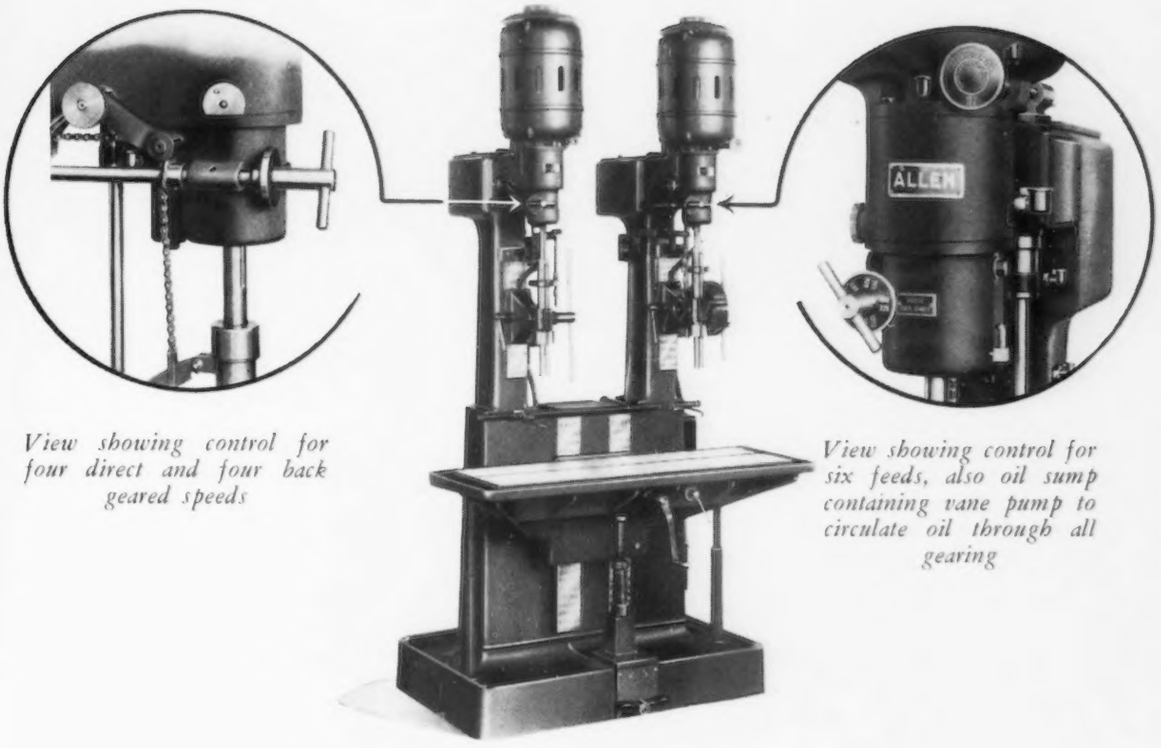
KINGSBURY design utilizing standard units meets this demand.

A large number of interesting installations are illustrated in our latest catalogue. Send for it.

KINGSBURY MACHINE TOOL CORP.
KEENE, NEW HAMPSHIRE

Originators of the Automatic Drilling Head Unit

DRILLING **ALLEN** TAPPING



View showing control for four direct and four back geared speeds

View showing control for six feeds, also oil sump containing vane pump to circulate oil through all gearing

Allen Drilling & Tapping Machines help WESTINGHOUSE *build quality products economically*

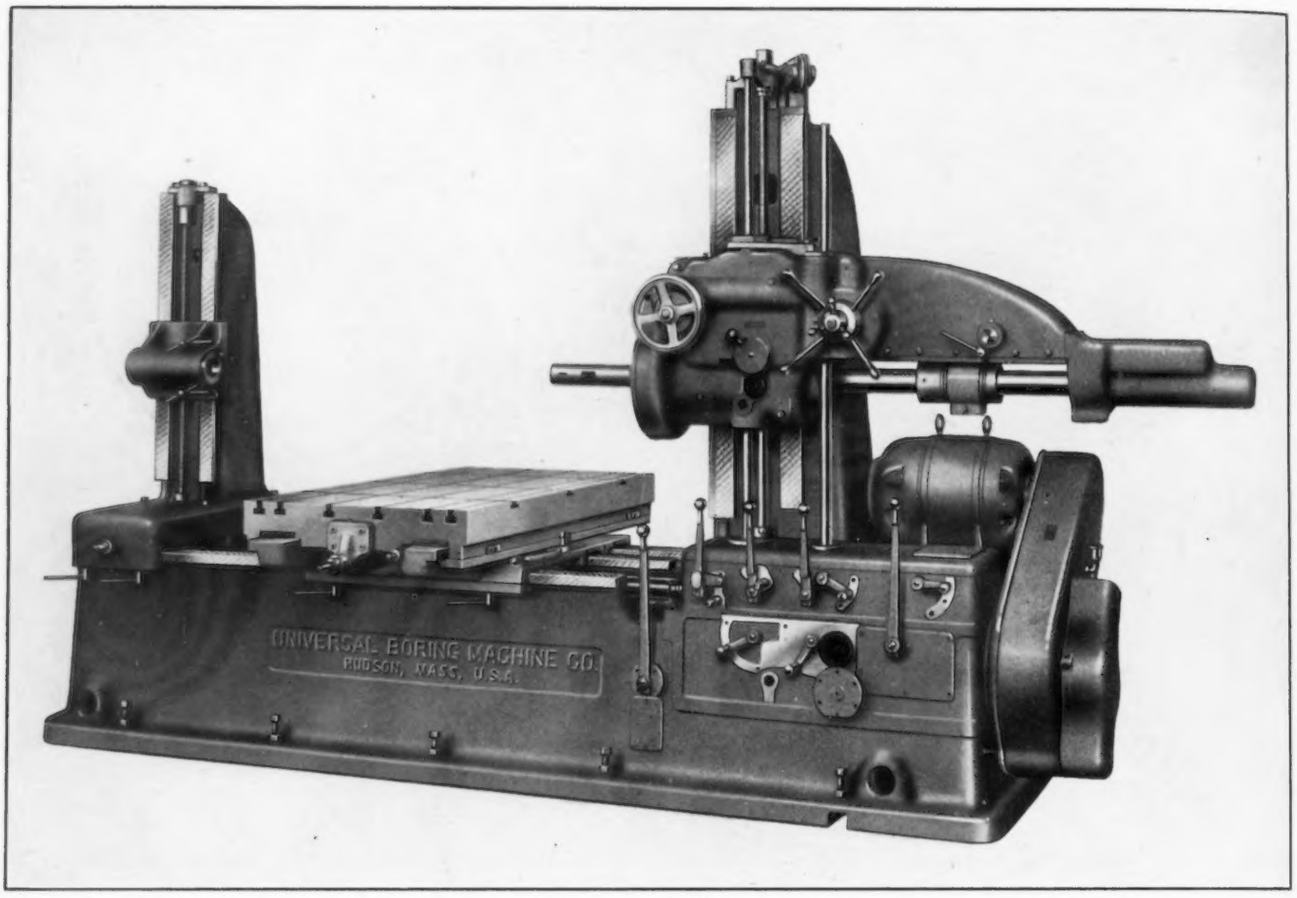
Our machines are made in all sizes as required—Standard or Special—and can be equipped with four speed Westinghouse motors direct on spindles as above or with standard motors and Vee Belt drives.

CHAS. G. ALLEN CO., Barre, Mass.

DRILLING **ALLEN** TAPPING

UNIVERSAL "HORIZONTAL" BORING MACHINE

WITH THREE INCH SPINDLE



Standard Code Words

"BEAUTY" Bed to Take 60 Inches long.
Vertical Range 27 Inches.
Table 26 Inches Wide, 58 Inches Long.

"BRIGAND" Bed to Take 72 Inches long.
Vertical Range 33 Inches.
Table 32 Inches Wide, 58 Inches Long.

"BURTEL" Bed to Take 96 Inches long.
Vertical Range 40 Inches.
Table 40 Inches Wide, 58 Inches Long.

UNIVERSAL BORING MACHINE CO.

HUDSON, MASS.

HARDINGE

BENCH MILLING MACHINES

AT

WESTINGHOUSE

NEWARK, N. J.

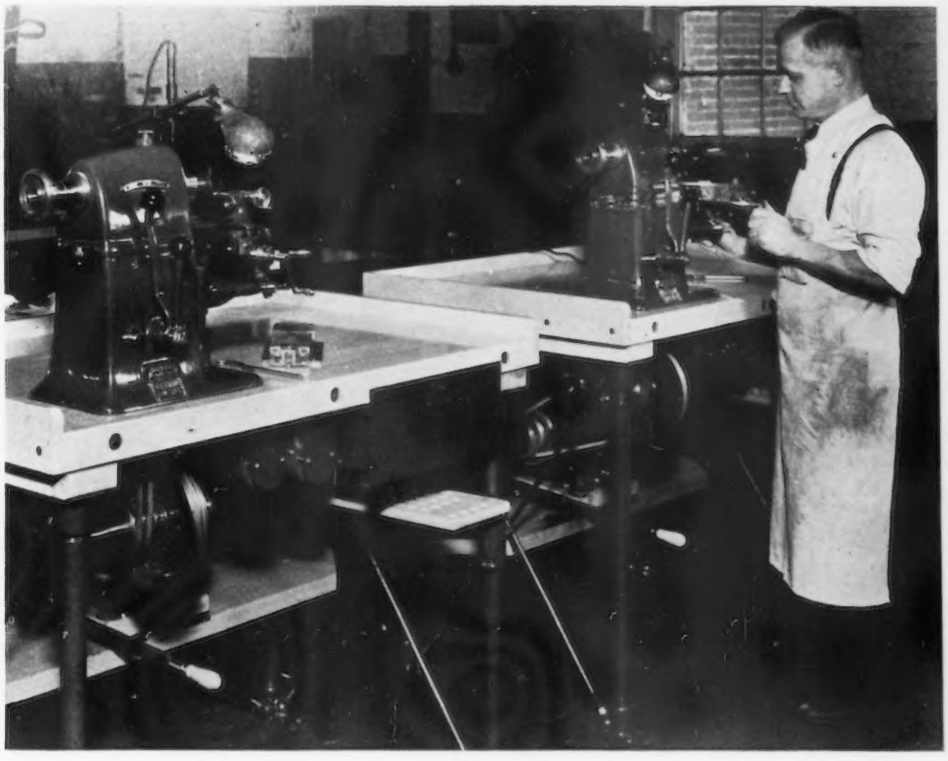
Hardinge Enclosed Head Bench Milling Machines handle a wide range of work in the tool room and other departments.

Spindle speeds range up to 2500 RPM, ¾" collet capacity for Cutter Headstock and Index Head.

Why allow large and expensive Milling Machines to complete operations when a Hardinge Bench Milling Machine is more efficient and economical?



● RAPID, ACCURATE AND CONVENIENT MILLING SERVICE ●



Cataract

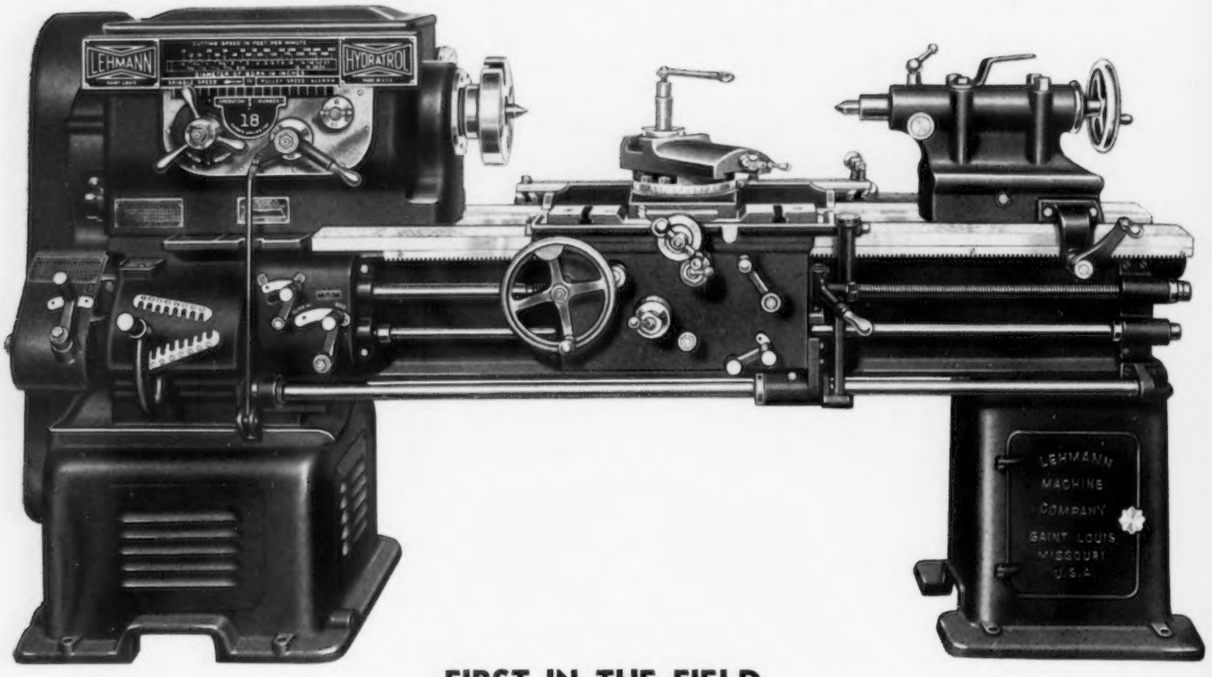
PRECISION BENCH LATHES, BENCH MILLING MACHINES, BENCH HAND SCREW MACHINES

— Ask for Bulletins —

HARDINGE BROTHERS, Inc. . . . . ELMIRA, N. Y.

CHICAGO—NEW YORK—DETROIT

ONE YEAR OLD TO THE PUBLIC
THE **HYDRATROL** LATHE
IS SEVERAL YEARS OLD IN APPROVED PERFORMANCE



FIRST IN THE FIELD

When the HYDRATROL lathe was introduced to the trade over a year ago it was a perfected machine and had proven its merits by exceptional performance under severe conditions of usage. It was the first public presentation of a lathe with hydraulically operated automatic speed changes for the spindle. Its features had been developed to a high degree of perfection in operation and for practical values to the user.



Showing set-up for four operations.

Set operation number to arrow point.

Improvements such as OPERATION NUMBER INDEX have been added.

Important Characteristics of the HYDRATROL Are—

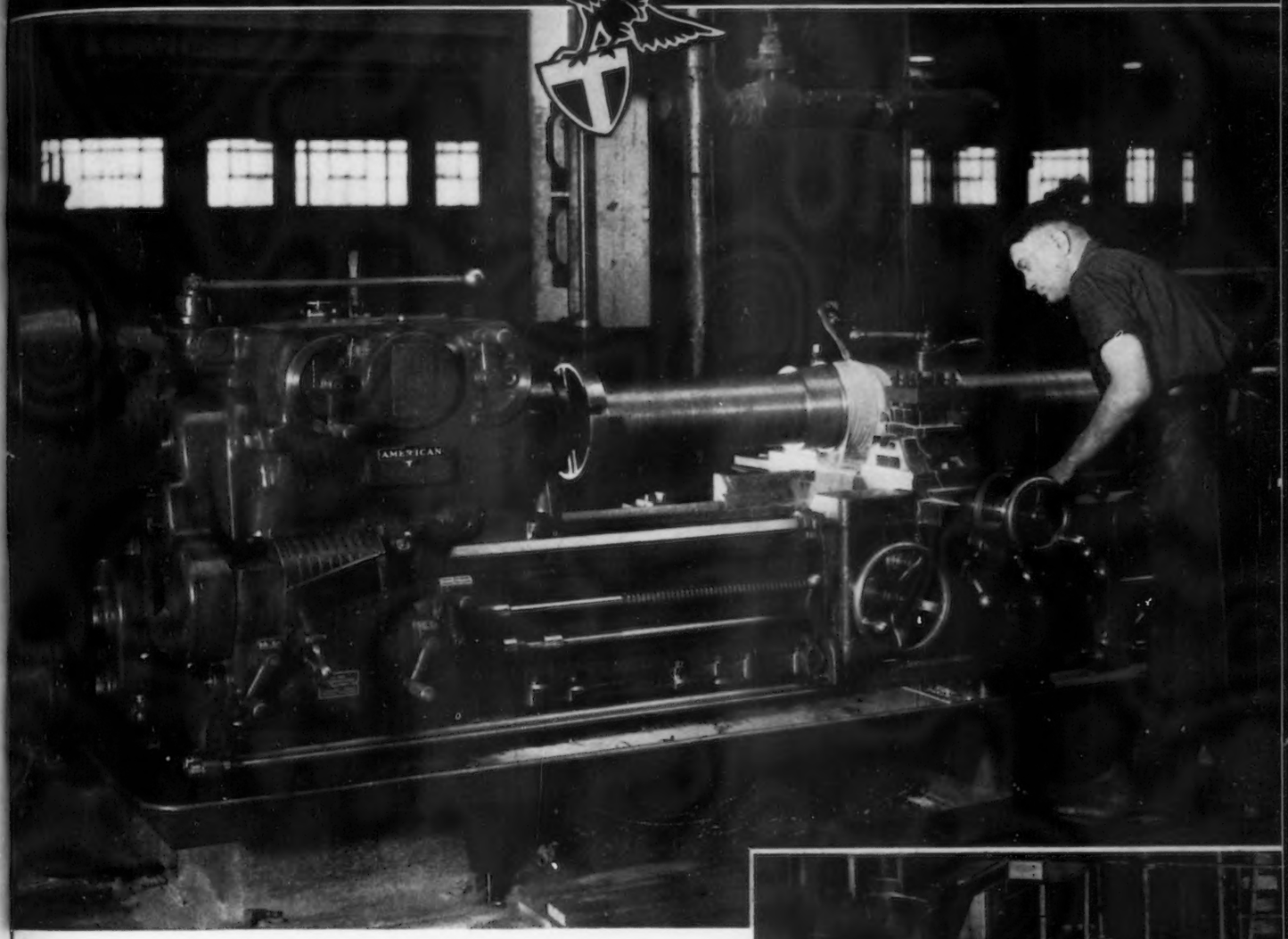
SPEED, SIMPLICITY AND SAFETY IN OPERATION.
LEGIBLE PRESENTATION OF ESSENTIAL INFORMATION.
SMOOTH RUNNING QUALITIES.
TREMENDOUS POWER CAPACITY.
NO REQUIREMENTS FOR ADJUSTMENTS.
ALL REASONABLE PROOF THAT THESE QUALITIES WILL ENDURE.
BUILT TO THE HIGHEST STANDARDS OF QUALITY.

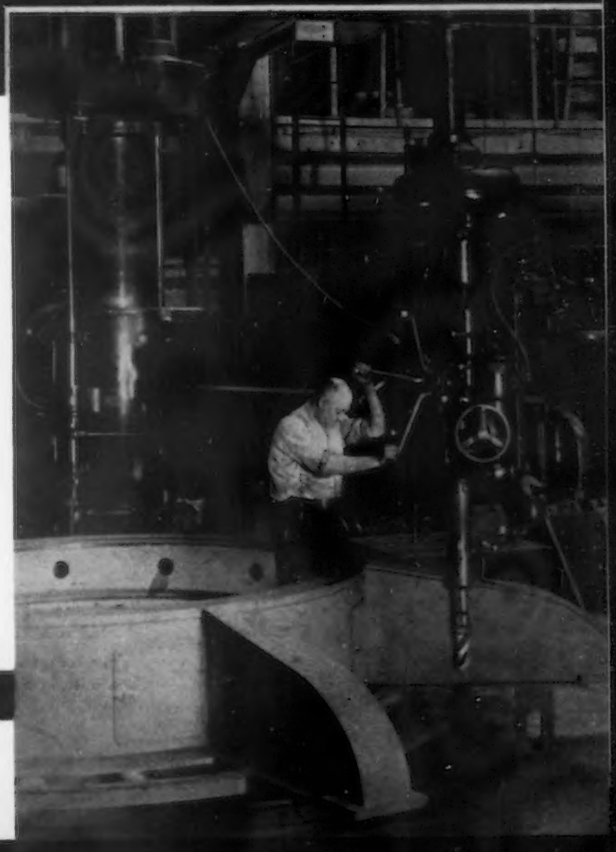
It Stops Running Before Lubrication Ceases and Until the Oil Supply Is Replenished

LEHMANN MACHINE CO.

3558 Chouteau Ave. — St. Louis, Mo., U.S.A.

Modern Manufacturing Requires
MODERN MACHINE TOOLS





And Westinghouse uses them! Two examples are here shown. One is a 20" American Lathe used for turning 30-40 point carbon steel gear shafts heat treated to 300 Brinell hardness. With cemented carbide tools this lathe takes a 1/2" cut at .020" feed per revolution at a cutting speed of 275 feet per minute. Westinghouse states that this American Lathe has increased production on gear shafts up to 75 per cent.

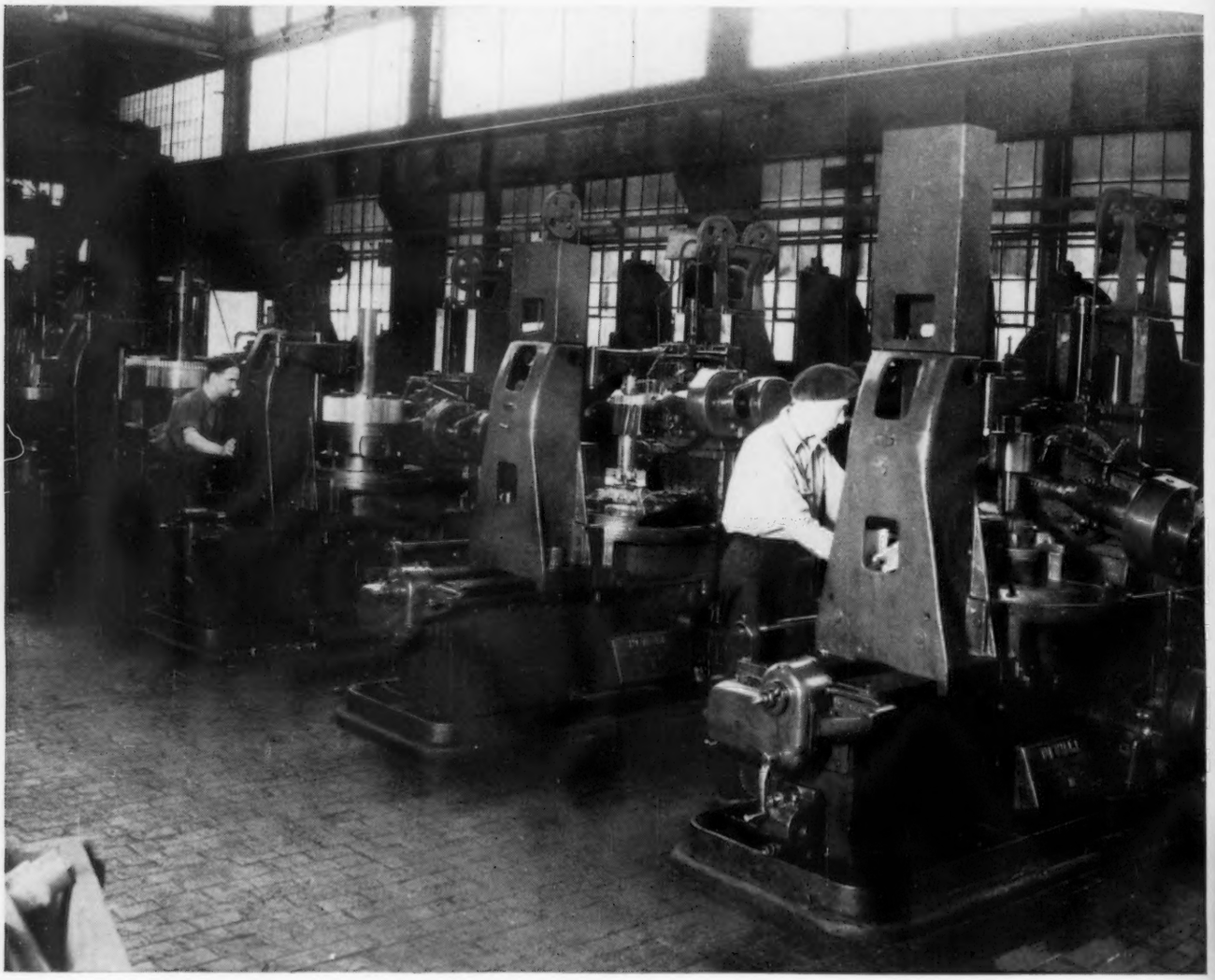
The other modern machine is one of the largest American Radial Drills ever built. This one has a 26" diameter column and a 12 ft. arm. It drills the holes profitably in large parts such as the upper bracket for a 750 KVA waterwheel generator shown by the illustration.

The Westinghouse Electric & Manufacturing Company has reached its 50th milestone. The reaching of many more is assured by the Westinghouse policy of building quality products and using modern tools and methods to do it.

THE AMERICAN TOOL WORKS COMPANY

MAIN OFFICE AND WORKS, CINCINNATI, U.S.A.
LATHES—RADIALS—SHAPERS

NEWARK GEAR



One of the batteries of

NEWARK MACHINES

which are helping Westinghouse on Gear Production

NEWARK GEAR CUTTING MACHINE CO.

69 PROSPECT STREET, NEWARK, NEW JERSEY

CONE AUTOMATICS

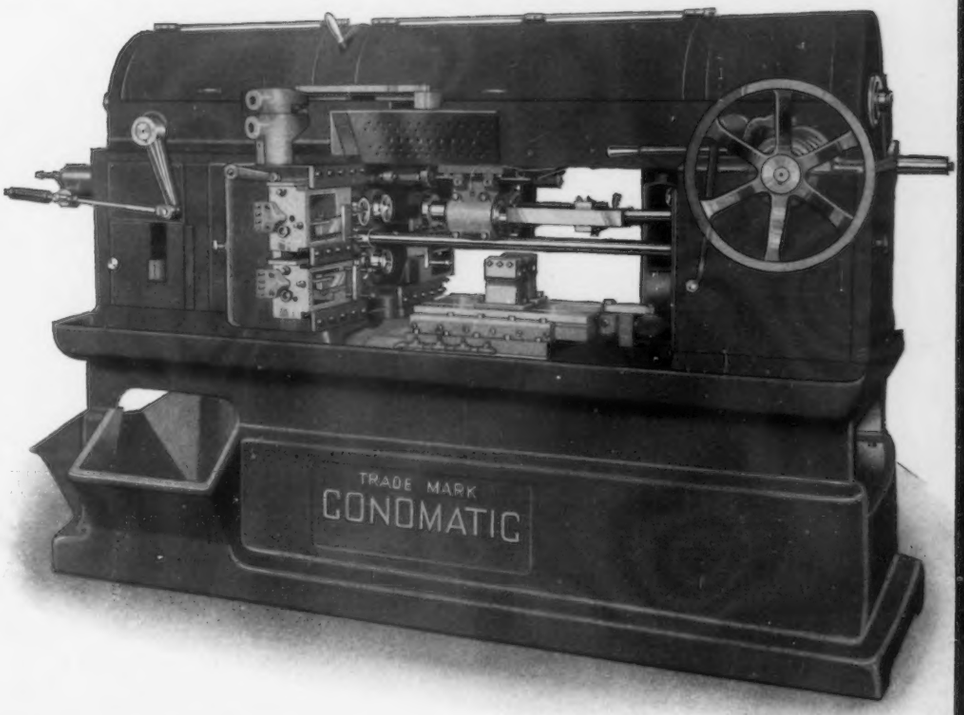
(Four and Eight Spindle Types)

Rigidly built for continuous operation at low unit cost.
Dependable and accurate over years of service—meeting all screw machine requirements.

DESCRIPTION

Conomatic, Four Spindle

Made in following sizes: 7/8—1 1/4 —1 1/2—2—2 1/4—2 5/8—3 1/2—4 3/8 and 6 inches.



This machine is of the Single Belt Drive Type. Can be driven either from countershaft or by motor.

FEED WORKS are arranged for a change of feed and are driven by a worm geared drive.

TOOL SLIDE is arranged to give two end working stations in first and second positions for drilling.

CROSS SLIDES. All cross slides arranged with independent feeds thus giving three forming positions and one cut-off position.

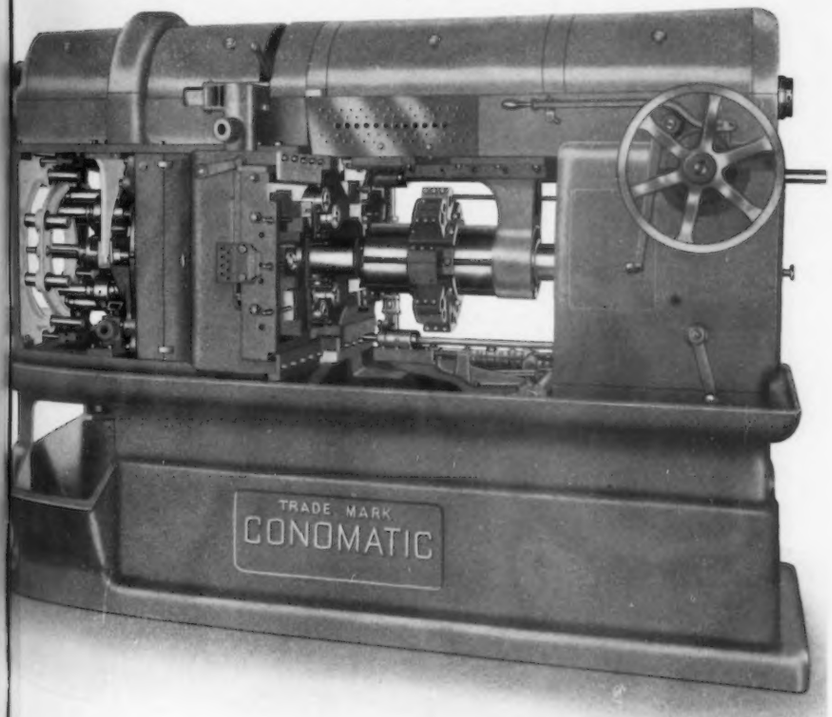
AUXILIARY HEAD. This allows for mounting of independent end working tools in third and fourth positions for drilling, reaming, threading, tapping, etc.

UNIVERSAL SLIDES. These special slides may be mounted on top bed for additional tooling when required.

SPINDLES are hardened and run in adjustable anti-friction bearings.

FRAME CONSTRUCTION is of the double bed type having a lower base, and a heavy overhead bed in which the cam drums are mounted.

COUNTERSHAFT has Anti-Friction Bearings.



DESCRIPTION

1 1/4" & 1 1/2" Conomatic, Eight Spindle

This machine is of the Single Belt Drive Type. Can be driven either from countershaft or by motor.

FEED WORKS are arranged for a change of feed and are driven by a worm geared drive.

TOOL SLIDE—special turret type arranged to give eight end working positions for drilling, turning, threading, etc.

CROSS SLIDES. Standard cross slides are arranged to give six tooling stations, five for forming and one for cutting off. An extra forming position for light operations is mounted on under side of top bed.

UNIVERSAL SLIDES. These special slides may be mounted on top bed for additional tooling when required.

SPINDLES are hardened and run in adjustable anti-friction bearings.

FRAME CONSTRUCTION is of the double bed type having a lower base, and a heavy overhead bed in which the cam drums are mounted.

COUNTERSHAFT has Anti-Friction Bearings.

CONE AUTOMATIC MACHINE COMPANY, Inc.

WINDSOR, VERMONT, U. S. A.

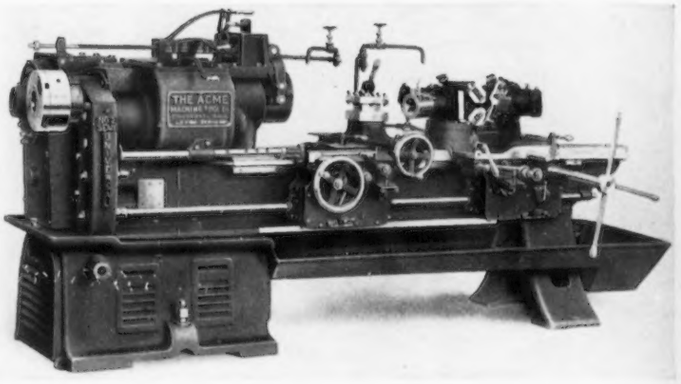
ACME *Congratulates*

WESTINGHOUSE

for 50 Years of Outstanding Service

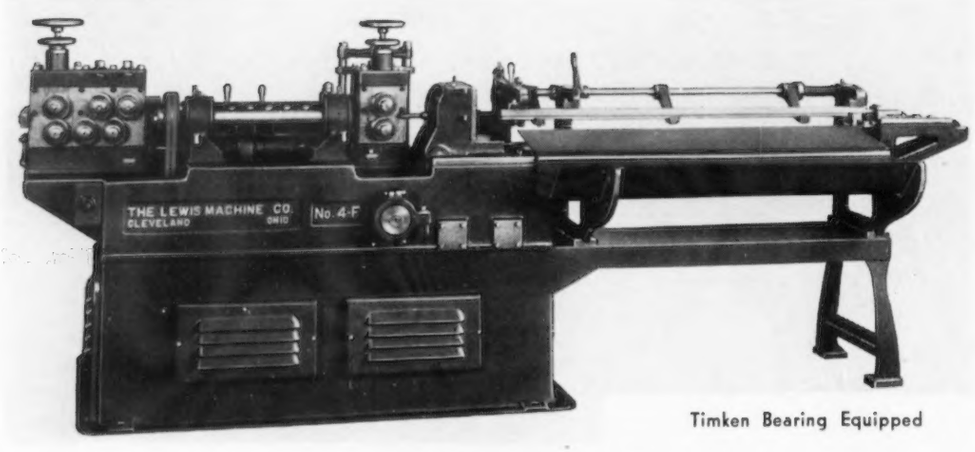
We are also pleased that CINCINNATI ACME Turret Lathes have assisted Westinghouse as attested by the fact that the Westinghouse Electric and Manufacturing Company is a large user over a long period.

A few CINCINNATI ACME Features appreciated by users include hardened steel one-piece vees, gravity lock shift, direct reading speed plates, full range lead-screw chasing attachment, triple roller bearing spindle, change gear shafts on anti-friction bearings, and many other features.



THE ACME MACHINE TOOL CO., Cincinnati, Ohio

A NEW PRINCIPLE WITH PROVED PERFORMANCE



Timken Bearing Equipped

THE LEWIS

TRAVEL-CUT

A MODERN FLYING SHEAR AUTOMATIC WIRE STRAIGHTENING AND CUTTING MACHINE
WIRE IS POSITIVELY GAUGED TO ACCURATE LENGTH BEFORE CUTTING

PURCHASES OF LEWIS WIRE MACHINES BY WESTINGHOUSE ARE ONE OF MANY PROOFS OF THEIR MERIT

THE LEWIS MACHINE COMPANY 1604 E. 24 ST., CLEVELAND, OHIO

HENRY & WRIGHT DIEING MACHINES
in the Line at Westinghouse

Automatic feeds, perfect registration and high speed characterize this improved type of Punch Press



A battery of Dieing Machines at Westinghouse.

Production of high quality motor and meter laminations in volume requires high production equipment of highest accuracy. Originally installing a few Henry & Wright Dieing Machines, Westinghouse Electric & Manufacturing Company now has several batteries of these machines in operation in its plants.

The 50-ton machines in the group illustrated are producing motor laminations, each machine stamping out one rotor and one stator complete at each stroke operating at 125 strokes per minute. Other Dieing Machines are used for production of a variety of stamped parts.

Originally developed to meet the precision requirements of lamination production, Dieing Machines are widely used for production in a vast variety of stamped parts involving piercing, blanking, drawing, forming, embossing and extruding. This combination of operations, together with the high speed and precision alignment of the machine, results in high production of extreme accuracy and with exceptional die life.

Let us send you catalogs or, better still, send us your prints or samples for production estimates.

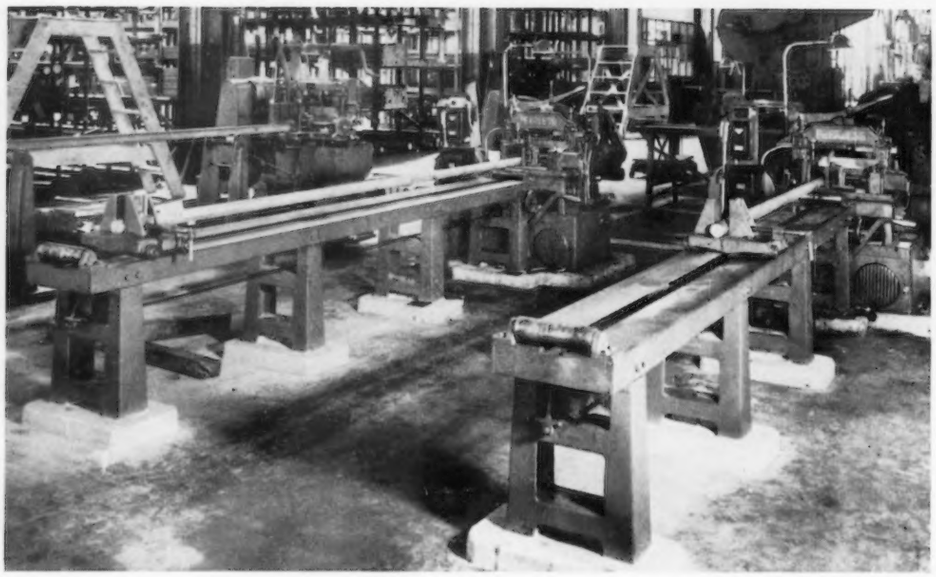
Automatic Steel Presses

DIEING MACHINES

Sensitive Drilling Machines

THE HENRY & WRIGHT MANUFACTURING CO.

HARTFORD, CONN.



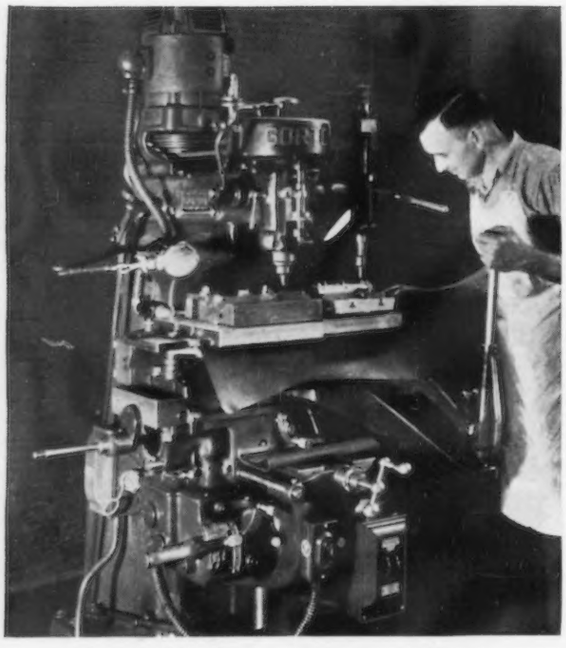
Above photograph shows two (2) New 6″ x 6″ Peerless Improved High Duty Metal Sawing Machines with Hydraulically Operated Full Automatic Bar Feed, which were installed last April in the plant of the Westinghouse Electric & Manufacturing Company at Essington, Pa.

This latest Peerless Machine is doing production work, cutting-off stainless steel bars automatically to desired length for fan blades.

"The Latest In Metal Sawing Equipment"

PEERLESS MACHINE COMPANY, Racine, Wisconsin

Duplicate Plastic Molds, Dies, &c.



A mold job being set up on a Gorton Duplicator in the Westinghouse plant

in One Half the Time and at One Half the Cost with GORTON DUPLICATORS

Comparisons made by present users of Gorton Duplicators on work covering several thousand hours of production on plastic and glass molds, die casting dies, etc., show an average saving in cost of more than 50% over previous methods.

Greater speed and accuracy were also secured. Tolerances of .001″ and closer can be maintained. No pattern is too complex for them to follow accurately. They are quickly set up and are simple to run. Gorton Duplicators are relatively low in cost and do not require trained operators.

For Duplicating Plastic, Glass, and Rubber Molds, Die Casting Dies, Small Drop Forging Dies, etc.

GEORGE GORTON MACHINE CO.
RACINE, WISCONSIN, U. S. A.

MARVEL HIGH-SPEED-EDGE ARMSTRONG-BLUM MFG. CO. CHICAGO, U.S.A. PAT. JAN. 8 APR. 1925

Only MARVEL offers:

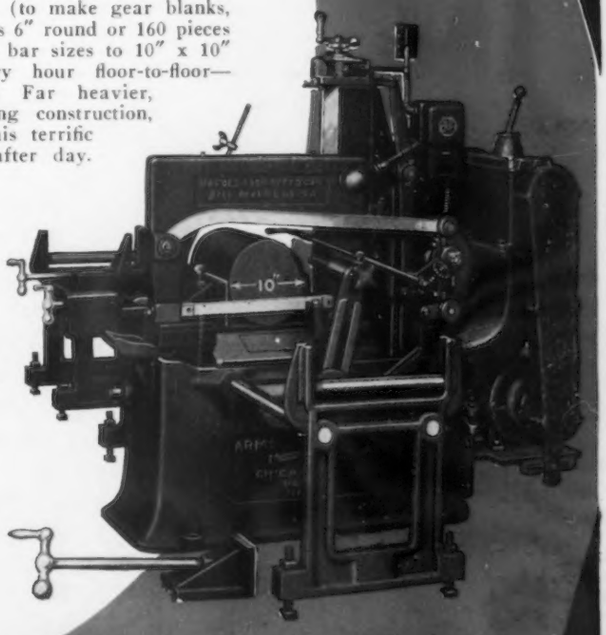
- *Unbreakable* High-Speed-Edge Saw Blades
- Ball-Bearing speed and stamina with automatic bar push up
- A "giant" hydraulic Saw with Roll-stroke blade action
- A *complete* line of sawing machines.

Ask any unbiased authority the outstanding developments in metal sawing and he will doubtless name: (1st) Unbreakable High-Speed-Edge Hack Saw Blades, (2nd) Heavy-Duty Automatic Production Saws and (3rd) the "roll-stroke" blade action of the No. 18 MARVEL "Giant" Hydraulic that has solved the problem of sawing extremely large work, even in the tougher alloys.

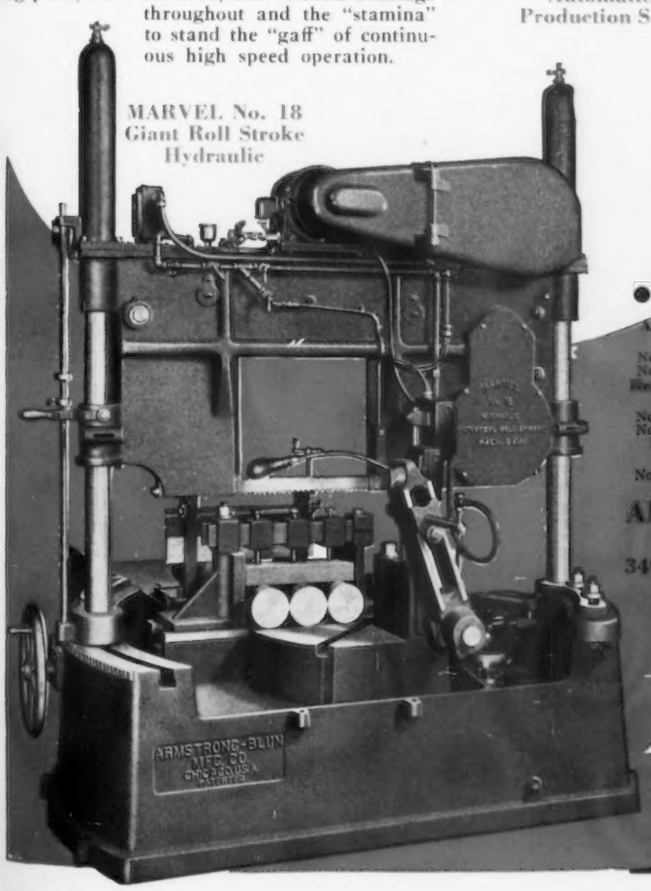
MARVEL High-Speed-Edge Blades combine the unequalled cutting quality and long life of a genuine 18% Tungsten High-Speed Steel cutting edge and the stamina and strength of a chrome vanadium steel body, permit greater tensioning (cutting accuracy), far greater feed pressures and cutting speeds (greater production), cut replacement cost to a minimum and deliver uninterrupted production at full capacity.

MARVEL No. 18 Hydraulic. Meets the needs of today and tomorrow—easily handles the Toughest Alloys and the Larger Bar Sizes. It introduces an entirely new principle of blade reciprocation that, for the first time, makes hack sawing really practical and efficient on extremely large work; and that has truly affected dependable accuracy. A rugged "giant," with fewer working parts, ALL enclosed, anti-friction bearings throughout and the "stamina" to stand the "gaff" of continuous high speed operation.

MARVEL PRODUCTION SAWS. Require no more attention than an automatic screw machine—feed to length and cut-off from solid bar steels (to make gear blanks, for example) 10 pieces 6" round or 160 pieces 1½" round (or other bar sizes to 10" x 10" proportionately) every hour floor-to-floor—AUTOMATICALLY! Far heavier, with full ball bearing construction, they will maintain this terrific speed all day, day after day. They cut cutting-off costs to a fraction—save stock (chip loss) and setting-up time.



MARVEL No. 9A Automatic Production Saw



MARVEL No. 18 Giant Roll Stroke Hydraulic

● *A Sawing Machine for Every Need*

Automatic Production Hack Saws	General Purpose Hack Saws
No. 6A (Capacity 6"x 6")	No. 1 (Capacity 6"x6")
No. 9A (Capacity 10"x10")	No. 2 (Capacity 8"x8")
Heavy-Duty High Speed Hack Saws	**Giant Hydraulic Hack Saw**
No. 6 (Capacity 6"x 6")	No. 18 (Capacity 18"x18")
No. 9 (Capacity 10"x10")	
Light High Speed Hack Saw	**Metal Band Saw**
No. 4B (Capacity 6"x6")	No. 8 (Capacity 18"x18")

ARMSTRONG-BLUM MFG. CO.
"The Hack Saw People"
349 N. Francisco Avenue, Chicago, U.S.A.

Standardize on

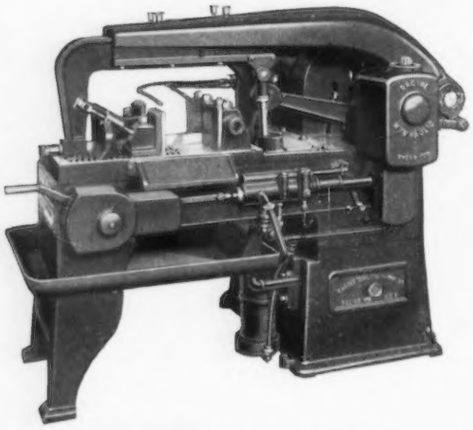
MARVEL

all the way

RACINE

HYDRAULIC PRODUCTION SAWS

10x10″, 12x12″, 10x16″ and 12x16″ Capacities



Heavy Duty Machines for the cutting of bar steel, die blocks, structurals, etc.

Full Hydraulic Control.

Easy Operation through single lever.

Three speeds for cutting full range of steels, including alloys, tool steels, high-speed and stainless.

Consistent, dependable performance at cutting rates never before obtained on reciprocating power saws.

Other machines for metal cutting—

Full line of sizes and types.

RACINE TOOL & MACHINE COMPANY

1755 State Street, RACINE, WISCONSIN

H & G Die Heads

H&G DIE HEAD

lower threading costs in Westinghouse plant

AT the left and below are shown the sensational H&B INSERT Chaser Die Heads. Designed to lower threading costs and to simplify the cutting of screw threads. Recommended for high production where chaser expense must be kept to a minimum and net production to a maximum.

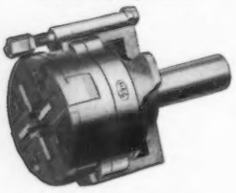
At the right are shown the H&G General Purpose Die Heads. They are famous for their simplicity and strength and for the accuracy and long life of their hobbed chasers. Recommended for dependability on all kinds of screw thread cutting.

Write for literature on H & G Die Heads and Threading Machines

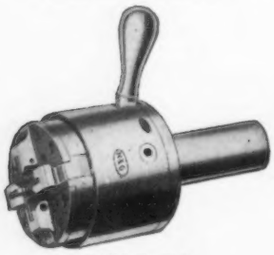
THE EASTERN MACHINE SCREW CORP.
21-41 Barclay St., New Haven, Conn.



STYLE MM
for rotary spindles.



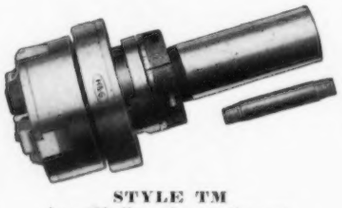
STYLE DM
for B&S Automatics and other small single spindles.



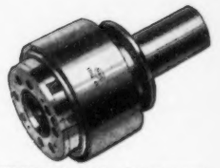
STYLE MS
for hand turret machines.



STYLE IMM
is equipped with improved internal trip for shoulder threading such as for spark plugs.



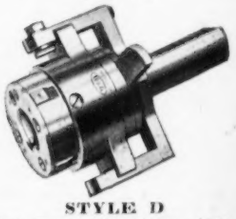
STYLE TM
has receding chasers for cutting superior quality taper pipe threads.



STYLE EE (Rotary)
For automatics, threaders, etc., where the die head rotates.



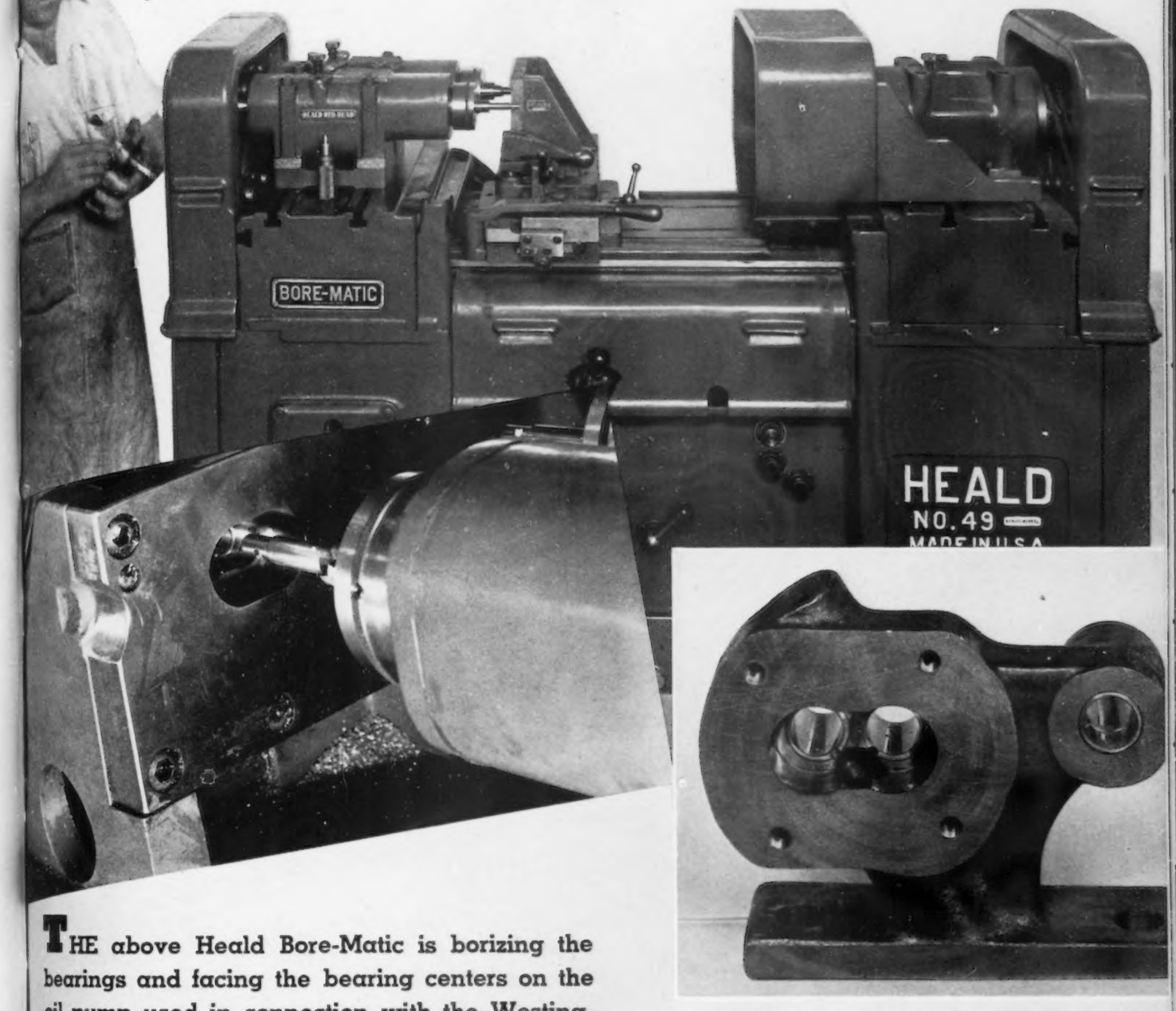
STYLE C
Hand Closing for hand turret machines.



STYLE D
For Brown & Sharpe Automatics and other small machines.

WESTINGHOUSE USES BORE-MATIC

for wide variety of air-conditioning parts



THE above Heald Bore-Matic is borizing the bearings and facing the bearing centers on the oil pump used in connection with the Westinghouse air conditioning compressor. The tolerances required are .0002".

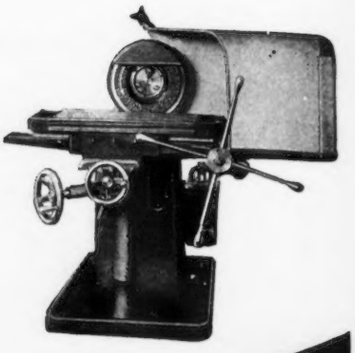
The machine is arranged so that with slight changes in the holding fixtures it will also handle not only the pumps but pistons, connecting rods, end and center bearings for their air conditioning units.

Note that stationary fixtures are being used on one end of the Bore-Matic and rotary on the other.

WHETHER it is for mass production of a single piece or for a normal number of a wide variety of parts on which there are boring, facing or turning operations, the design of Heald Bore-Matics is such that the requirements can be readily met.

The HEALD Machine Co. Worcester Massachusetts

MASTER Tools for MASTER Workmen



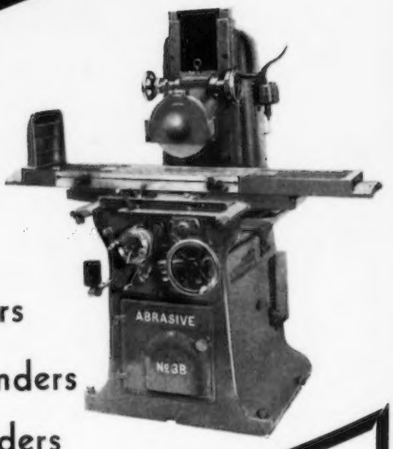




This MODERN line of Surfacing equipment

ABRASIVE

stands ready to meet MODERN requirements.



Face Grinders
Hand Feed Surface Grinders
Vertical Spindle Surface Grinders
Automatic Surface Grinders
Pulley Grinders
Accessories



SPEEDY
ACCURATE
DURABLE

ABRASIVE MACHINE TOOL CO.
EAST PROVIDENCE, R. I.

WRITE FOR
DESCRIPTIVE CIRCULARS

MODEL BB
12 x 12 x 24
THOMPSON
HYDRAULIC
SURFACE
GRINDER
with
HIGH SPEED
ATTACHMENT



OPERATION

"Internal and External Grinding the laminated faces of automatic starter magnet cores to an accuracy of .0001"."

To-day it is necessary to grind many parts formerly finished by less exact methods. The above illustration shows one of the many special applications of the Thompson Hydraulic Surface Grinding Machines. This machine is also equipped with a dual wheel mount for straddle grinding in two planes using 10" and 12" diameter grinding wheels.

THE THOMPSON GRINDER CO.

SPRINGFIELD, OHIO, U. S. A.

May we send you our Catalogue G4



Grinding connecting rod for refrigerator compressor on Bryant Internal Grinder.

Illustration shows grinding the crank hole—wrist pin hole also ground on Bryant Grinder.

EVERY HOUSE NEEDS WESTINGHOUSE and Westinghouse needs Bryant

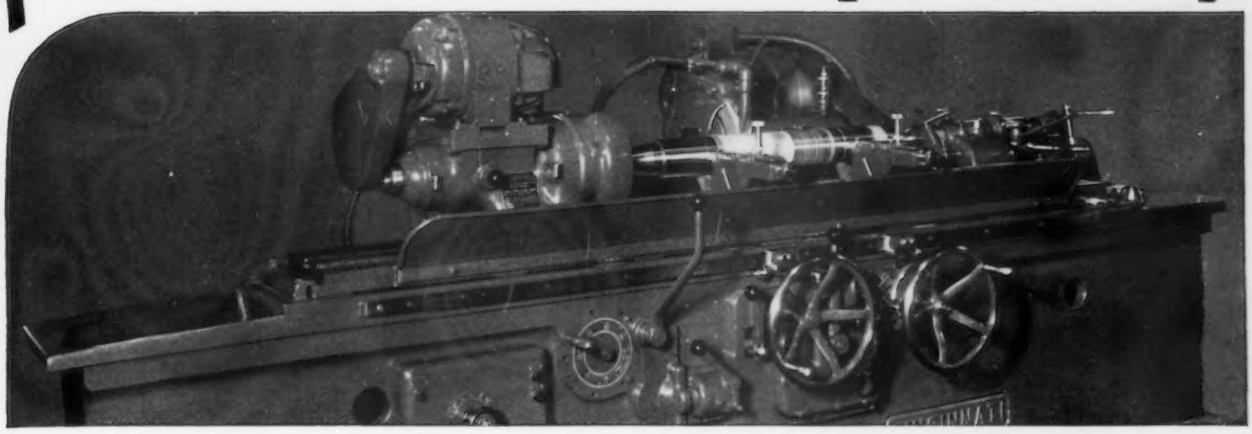
NEEDS BRYANT—as you need them for quality production on such exacting work at low cost. Take these Westinghouse refrigerator parts for example. Perhaps you are inclined to dismiss them with the thought, "Pretty light stuff, easy to grind and don't have to be very close" . . . . But think again. What happens to refrigerators? People buy them and forget them. After the refrigerator is sold, no master mechanic is going to be able to watch it. This connecting rod is being Bryant ground to + .0002 in crank and wrist pin hole. Those bearings are going to run for years unseen, untouched. They must be right. The finish must be extremely fine, but production must be kept up. That's why Westinghouse chooses Bryant Chucking Grinders. Write us today for information on grinding similar jobs of your own.

BRYANT

CHUCKING GRINDER COMPANY

Springfield, Vermont, U. S. A.

For Better, Faster Grinding



Operation: Finish Grind Wheel Spindle.
Material: Steel Forging S.A.E. 3145.
Spindle Speed: 1700 R.P.M.
Coolant: 1 Part Sunoco to 40 Parts Water.
Courtesy of Cincinnati Grinders, Inc., Cincinnati, Ohio

SUNOCO IS USED SUCCESSFULLY ON ALL TYPES OF MACHINES

WITH the aid of Sunoco, all types of grinding machines produce better work at higher speeds and at lower costs because it offers these definite advantages:

SUNOCO increases the life of abrasive wheels.

SUNOCO insures more pieces per wheel dressing.

SUNOCO permits closer limits of accuracy, smoother surfaces and brighter finishes at higher speeds.

SUNOCO prevents over-heating, distortion and surface hardening.

SUNOCO is a rust-preventive.

SUNOCO is hygienic . . . will not develop pus-forming bacteria.

A trial under your own operating conditions will convince you that Sunoco makes faster, better grinding possible.

Operation: Finish Grind Gear Tooth Contour.
Material: S.A.E. 6150 Steel.
Spindle Speed: 1240 R.P.M.
Coolant: 1 Part Sunoco to 40 Parts Water.
Courtesy of Pratt and Whitney, Hartford, Conn.



SUNOCO
EMULSIFYING
CUTTING OIL

Operation: Surface Grinding 24 in. dia. Transmission Sprocket.
Stock Removed: 1/32" per Side.
Coolant: 1 Part Sunoco to 40 Parts Water
Courtesy of the Blanchard Company, Cambridge, Mass.

SUN OIL COMPANY, PHILADELPHIA, U. S. A.

Subsidiary Companies: Sun Oil Company, Ltd., Montreal, Canada
British Sun Oil Company, Ltd., London, England



In the Westinghouse Tool rooms you'll find the White Aloxite Brand Aluminum Oxide "AA" and "270" Bond Blue Wheels on many machines, grinding cutters, reamers, dies and general tools. Cutting clean, fast, cool.



Surfacing hardened steel punching dies and miscellaneous carbon and machine steel on a 60 inch Blanchard Surfacer using Aloxite Brand Aluminum Oxide segments in 24 grit.



In the grinding and conditioning of their tungsten carbide tools, Carborundum Brand "Green Grit" Wheels and Carborundum Brand Diamond Wheels are giving them perfect edges . . . straight, clean, un-nicked . . . perfectly finished . . . with greater speed, lessened wheel costs.



The centerless grinding of steel rods before Nitriding on a Cincinnati Machine is taken care of by Aloxite Brand Wheels in 502 grit . . . feed wheel in 80 grit.

CARBORUNDUM WELCOMES A GOLDEN OPPORTUNITY TO CONGRATULATE WESTINGHOUSE

For many years we have appreciated the opportunities we have had to serve Westinghouse.

Now we welcome the opportunity to offer our warmest congratulations upon the Golden Anniversary of that famed institution that has contributed so much to industrial progress.

And Carborundum Brand Products have played . . . and are playing no small part in Westinghouse Production.

In the tool room . . . the foundry . . . in every plant department where grinding and finishing is done . . . you will find the grinding wheels and other abrasive products of The Carborundum Company.

So widespread . . . so diversified . . . is the work that practically every type of grinding is represented in Carborundum service to Westinghouse.

CARBO

THE CARBORUNDUM COMPANY

Niagara Falls, N. Y.

Sales Offices and Warehouses in New York, Chicago, Philadelphia, Cleveland, Cincinnati, Pittsburgh, Boston, Detroit, Grand Rapids

(Carborundum and Aloxite are registered trade-marks of The Carborundum Co.)



Unusually interesting, the finishing of this massive runner plate for Boulder Dam generator. First ground with Carborundum Brand Silicon Carbide Green Grit Wheels in 120 grit, then honed with special shaped F. Grit blocks set in boring mill head, finally hand honed to beautiful finish and within half a thousandth of an inch of perfect flat.

Grinding malleable iron armature quills and Shelby tubing. Here Aloxite Brand Aluminum Oxide Wheels 24 x 4 x 5 inches in 50 grit, M grade, are giving desired production, finish and wheel economy.

On any number of portable grinding jobs about the plan such as cast steel motor frames, Aloxite Brand Resinoi Bonded Grinding Wheels are carrying their share o Carborundum service to Westinghouse.

MEETING THE GRINDING REQUIREMENTS *of Westinghouse*



NORTON ABRASIVES

and the Whole Electrical Industry

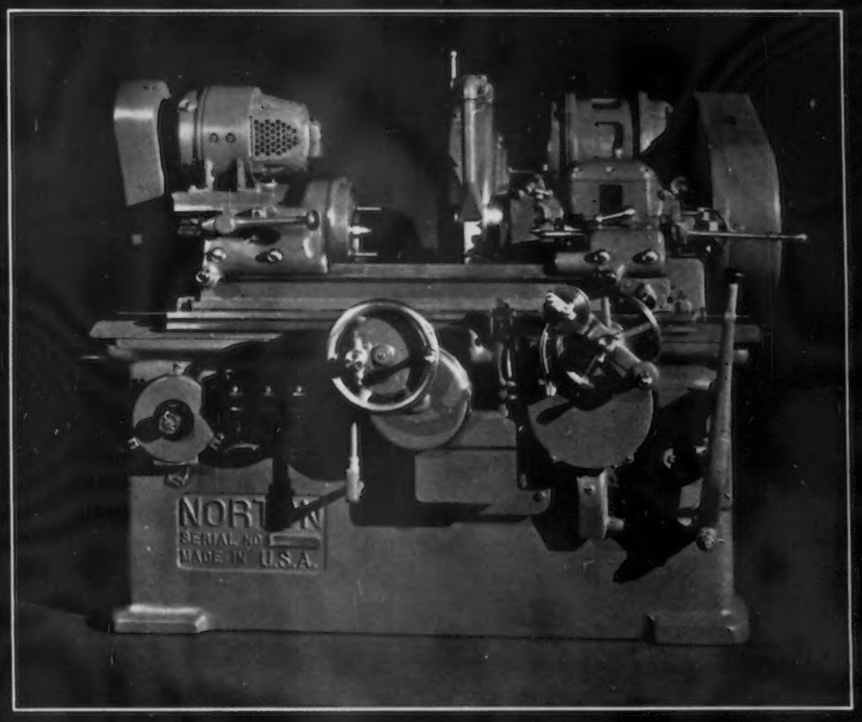
FIFTY years ago Westinghouse started manufacturing electric equipment—and introduced alternating current, a revolutionary development. Fifty years ago Norton began to supply industry with abrasive products—and introduced the vitrified grinding wheel, a revolutionary man-made product to replace the natural sandstone.

For a half century Westinghouse and Norton have played an important part in their respective industries—have pioneered in developing new products and improving old ones.

Today Norton Grinding Wheels and Abrasives, Norton Grinding and Lapping Machines are important factors in producing quality products in the Westinghouse plants—factors of production and precision in the electrical industry.

NORTON COMPANY, WORCESTER, MASS.
New York Chicago Detroit Philadelphia Pittsburgh
Hartford Cleveland Hamilton, Ont. London Paris
Wesseling, Germany Corsica, Italy

W-551



NORTON
GRINDING & LAPPING
MACHINES



EXTERNAL



INTERNAL



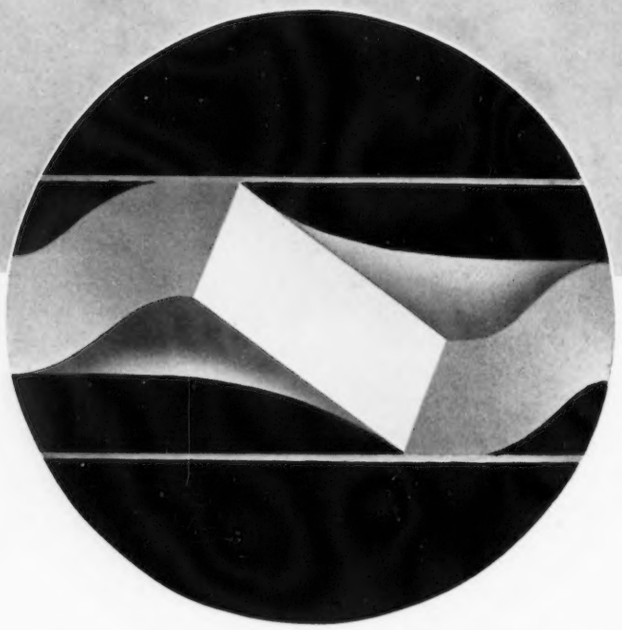
COUNTER SUNK



TERMINALS

U. S. Pat. Nos. 1,419,564; 1,782,387; 1,604,122; 1,963,800

SHAKEPROOF
LOCK WASHERS



NEW tapered-twisted TOOTH

combines strut-action and powerful spring-tension!

THE new tapered tooth design of the Shakeproof Lock Washer provides a positive method for holding nuts and screws absolutely tight. Each tooth is twisted—one edge up and one edge down—the top edge biting into the nut—the other digging into the work surface. Thus, a sturdy strut is placed between the nut and the work—setting up a powerful leverage which definitely prevents any backward movement of the nut. The tapered design also provides a strong spring-tension because the greater width of each tooth at the root enables the body to resiliently cooperate in resisting any flattening effect. Thus, in the Shakeproof Lock Washer, there is positive strut-action supported by powerful spring-tension which combine to produce a lock that vibration cannot loosen—in fact, as vibration increases, the teeth bite even deeper—making the lock tighter than ever!



ASSORTED TEST RING

Seeing is believing! Give Shakeproof a trial—compare it by actual test with any other lock washer. To help you, we offer this handy test ring including samples of both internal and external types in six different sizes. It's free, of course, so send for yours today!

SHAKEPROOF TAPPING SCREWS



WITH STANDARD MACHINE SCREW THREAD

▼ ▼

WRITE FOR FREE TESTING SAMPLES

U.S. Pat. Nos. 1,862,486; 1,909,476; 1,909,477

SHAKEPROOF LOCK WASHER CO.

Distributors of Shakeproof Products Manufactured by Illinois Tool Works

2501 N. Keeler Avenue **Chicago, Illinois**

ILLINOIS TOOLS





ONE IMPORTANT DIFFERENCE IS..

..METALLURGICAL TOLERANCE!

TOLERANCE in tool design is universal. *Tolerance* in metallurgy is a feature of Illinois Tools. Metallurgical *tolerance* determines the uniform response of Illinois Tools to forging—heat treatment—dimensional accuracy in the finished treated tool—uniform high standard of performance. Illinois Tools are saving money on countless production operations. Illinois metallurgy is one reason you save money by using Illinois Tools!

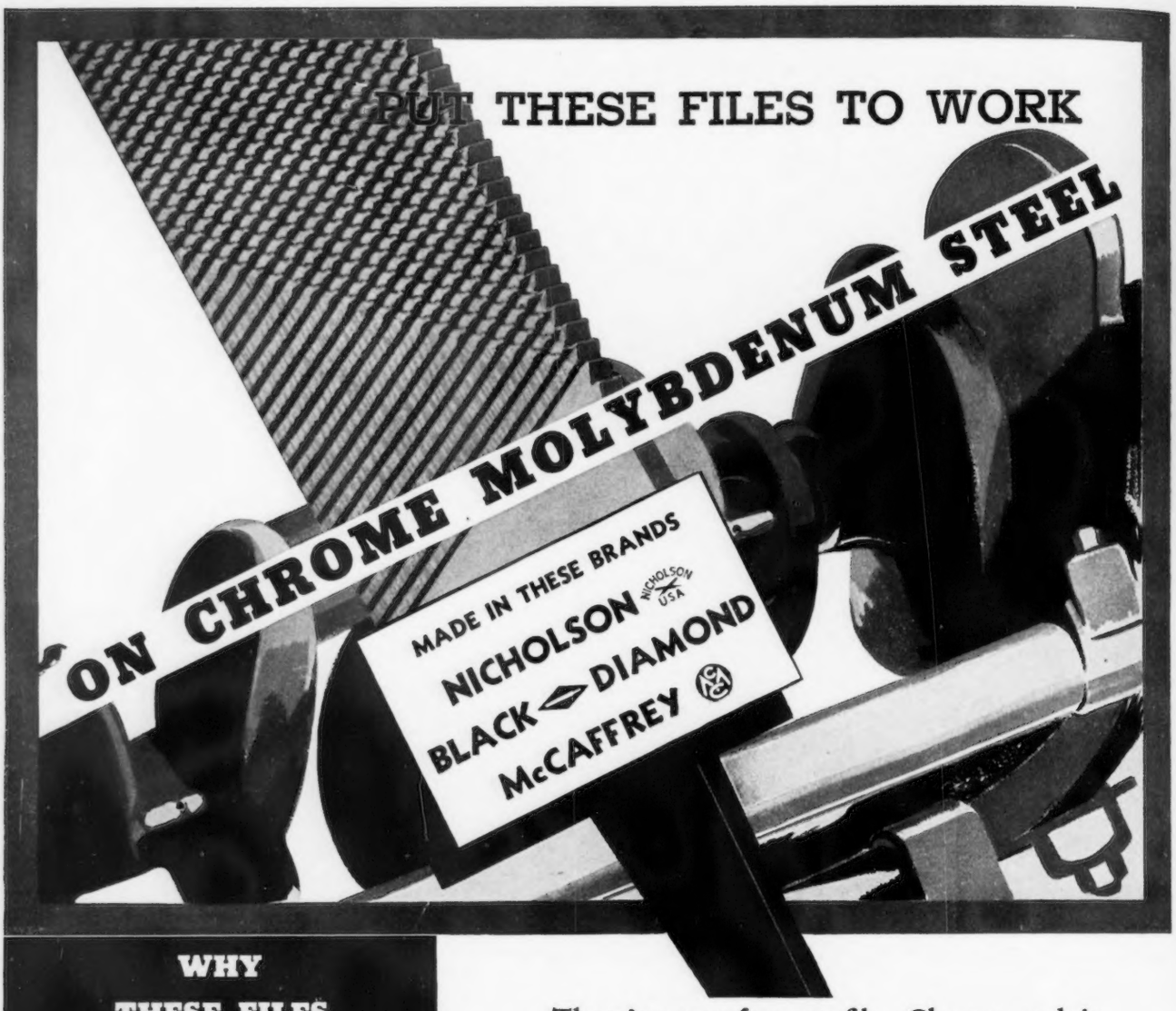
ILLINOIS TOOL WORKS

2501 N. Keeler Avenue **Chicago, Illinois**

Manufacturers of

Milling Cutters	Metal Slitting Saws	Ground Form Tools
Hobs	Broaches	Special Cutting Tools
Gear Cutters	Reamers	Carbide Cutting Tools
Gear Shaper Cutters	Rotary Shears	Gear Measuring Machines

Buy ILLINOIS METALLURGY *in your tools!*



WHY THESE FILES REMOVE MORE CHROME MOLYBDENUM STEEL

•

Up to 3 times as many cutting edges per square inch.

•

Reserve cutting edges go to work as old ones wear down.

•

Modern tooth construction keeps file on line of work.

PATENTS PENDING

There's a test for any file. Chrome molybdenum steel. The modern steel — the hard steel — used in hundreds of industrial plants.

Put Nicholson, Black Diamond or McCaffrey Files to work on chrome molybdenum steel. Check the filing time. Notice the condition of the teeth of these new files when ordinary file teeth are worn down.

Test these files on chrome molybdenum steel or on other steels — or cast iron, brass or bronze — you'll find Nicholson, Black Diamond and McCaffrey Files the sharpest, fastest, most durable files that carefully spent dollars can buy. At mill supply dealers. Nicholson File Company, Providence, R. I., U. S. A.

A FILE FOR EVERY PURPOSE

THERE IS A DIFFERENCE



TOOLS look a good deal alike at the start—but long hours of production work soon demonstrate what a difference there is.

Results show the value of careful steel selection, thoroughly mastered heat treating procedure, rigid adherence to accuracy standards. These are the reasons why Morse Tools are different. They work longer and faster between sharpenings. They bring your production costs down where they belong.

The Morse Line includes High Speed and Carbon

- DRILLS
- REAMERS
- CUTTERS
- TAPS AND DIES
- SCREW PLATES
- ARBORS
- CHUCKS
- COUNTERBORES
- MANDRELS
- TAPER PINS
- SOCKETS
- SLEEVES

MORSE

TWIST DRILL & MACHINE COMPANY

NEW BEDFORD, MASS., U.S.A.

New York Store, 130 Lafayette Street

Chicago Store, 570 West Randolph Street

"Greenfield" Tools Help Make Westinghouse Refrigerators

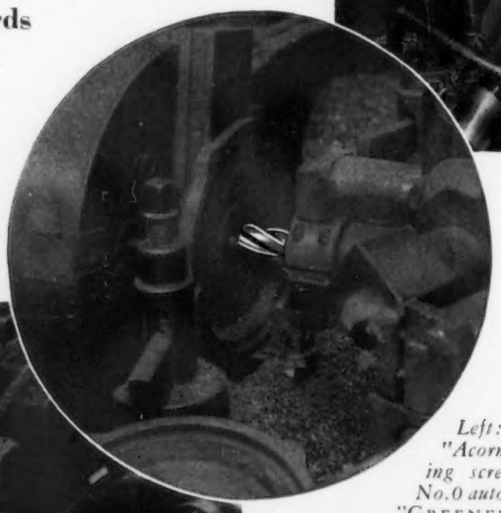
These photographs of Electric Refrigerator production indicate the confidence which Westinghouse reposes in *all* "*Greenfield*" small tools — Taps, Dies, Twist Drills, Reamers, Gages.

Unfailing standards of quality have brought Westinghouse to its present high place in industry. Only similar high standards could produce tools capable of meeting Westinghouse's requirements.

GREENFIELD TAP & DIE CORPORATION
GREENFIELD, MASSACHUSETTS
Detroit Plant 2102 West Fort St.
WAREHOUSES IN NEW YORK AND CHICAGO



1½-16" High Speed "Maxi" Tap threading refrigerator magnet case.

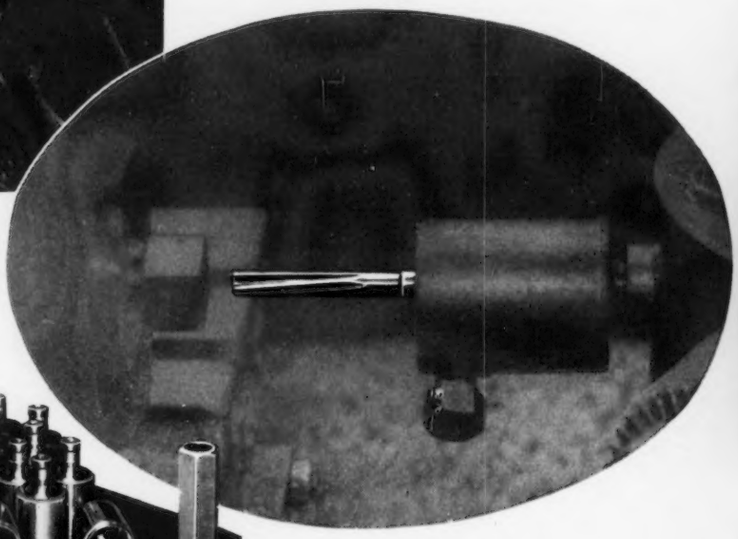


13/16" "Maxi" Core Drill drilling compressor assembly bracket.



Left: 10-32 ASME "Acorn" Die threading screws on B&S No.0 automatic. (Note "GREENFIELD" ring thread gage.)

Below: .2215" High Speed "Maxi" Stub Reamer sizing valve seats.





Final Inspection — with "GREENFIELD" "Go" and "Not Go" Thread gages.

GREENFIELD

In Canada: Greenfield Tap & Die Corp. of Canada, Ltd., Galt, Ont.

POWER CHUCKING

THE CUSHMAN WAY
WITH
THE CUSHMATIC POWER UNIT



WRITE US FOR THE NEW BULLETIN NO. 152

OUR NEW POWER CHUCKS

THEY ARE FURNISHED EITHER WITH OR WITHOUT

OUR ELECTRICALLY OPERATED MOTOR UNITS

THE NO. A-840 POWER WRENCHES

HAVE YOU OUR LATEST CATALOGUE? NO. 48—1936

Wrench Operated Chucks For Every Purpose

THE CUSHMAN CHUCK CO. HARTFORD, CONN., U.S.A.

EX-CELL-O MACHINES AND TOOLS PAY FOR THEMSELVES

XLO



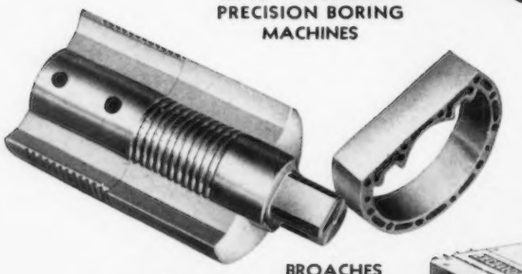
JUNIOR SINGLE-END PRECISION BORING MACHINES



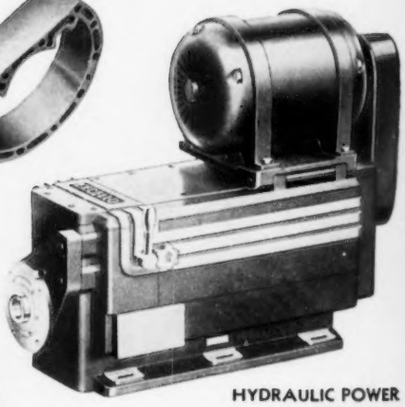
SENIOR DOUBLE-END PRECISION BORING MACHINES



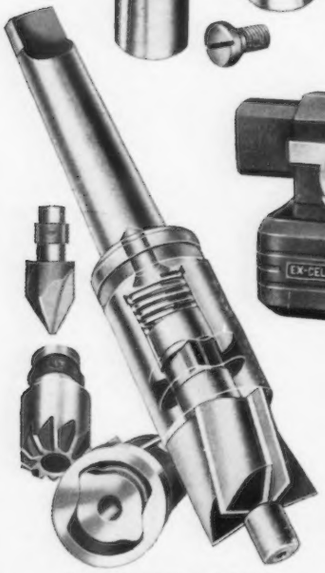
DRILL JIG BUSHINGS



BROACHES



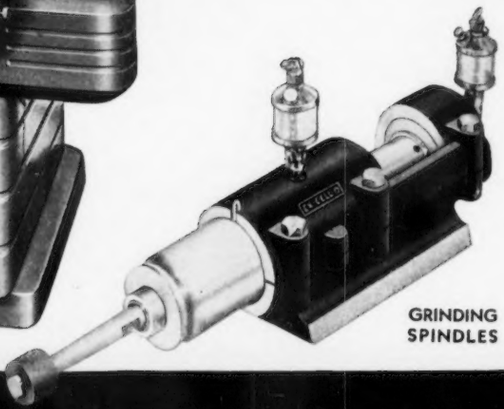
HYDRAULIC POWER UNITS



INTERCHANGEABLE COUNTERBORES



PRECISION THREAD GRINDERS



GRINDING SPINDLES

EX-CELL-O AIRCRAFT AND TOOL CORPORATION

1210 OAKMAN BLVD. • DETROIT



• The story of "Peerless" High Speed Reamers can be told in three words: (1) SPEED—in the high speed blades, where the wear comes; (2) TOUGHNESS—in the strong, shock-resisting alloy steel bodies, where the strain comes; (3) EXPANSION—at the cutting edge, where long life, coupled with accuracy, can be insured at considerably less cost than one pays for the more brittle solid high speed reamers in volume production.

Because they are backed up with a tough body, "Peerless" High Speed Reamers can be run at surface speeds of from 50 to 100 feet per minute according to the material to be reamed. Solid high speed reamers can be operated no faster—and cost a good deal more both per reamer and per hole reamed.

Ask your regular source of supply about "Peerless" High Speed Reamers. Or, write us and let us SHOW you what "Peerless" Reamers will do to help reduce your volume production costs.

The CLEVELAND TWIST DRILL COMPANY
1242 EAST 49th STREET
CLEVELAND

TRADE MARK REG. U S PAT OFF AND FOREIGN COUNTRIES

30 READE ST. NEW YORK · 9 NORTH JEFFERSON ST. CHICAGO · 654 HOWARD ST. SAN FRANCISCO
6515 SECOND BLVD., DETROIT · LONDON - E. P. BARRUS, LTD.- 35-36-37 UPPER THAMES ST., E.C.4

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WESTINGHOUSE
1886 W 19
GOLDEN JUBILEE



Accuracy

In the Westinghouse plants FEDERAL PRECISION INSTRUMENTS help maintain the precise duplication of parts. They will speed up your inspection too.

Over 150 models enable you to select those best suited to your needs. Time after time under comparative tests Federals are the ultimate choice.

FEDERAL PRODUCTS CORPORATION
1144 Eddy Street, Providence Rhode Island

Wire Gauges
Wire Insulation Gauges
Mica Gauge
Friction Tape Gauge
Rubber Thickness Gauges
and many other types for checking dimensions with required standards

Send for Catalog No. 40

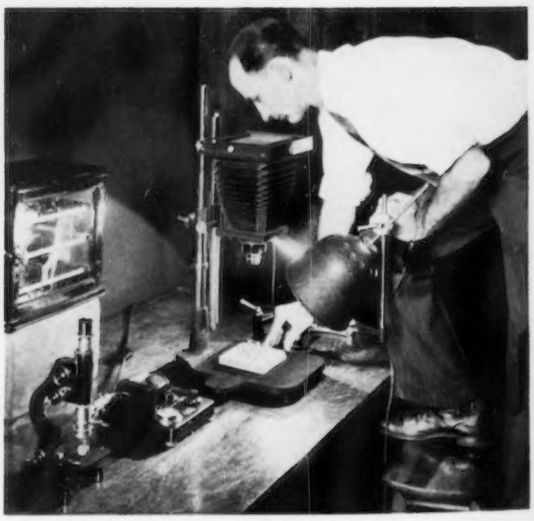
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Leitz Large Micro-Metallograph MM-1 with facilities for darkfield illumination and polarized light

Superior results presuppose superior equipment



Leitz Ultropak Microscope and Photomicrographic Apparatus

LEITZ Microscopes and Photomicrographic equipment in the Philadelphia plant of The Westinghouse Electric and Manufacturing Company.

E. LEITZ, Inc., 60 East Tenth Street, N. Y. C.

Branches: Chicago, Detroit, Washington.
Western Agents: Spindler and Sauppe, San Francisco and Los Angeles, Calif.

WESTINGHOUSE USES THE SHEFFIELD VISUAL



Checking inside diameter large end of connecting rod

Wherever accurately dimensioned parts are made or precision mechanisms assembled, the Sheffield Visual Gage is usually the standard of control. It appeals to American industry because:

1—It is deadly accurate and always consistent.

2—It is easy and quickly read—the most rapid precision inspection gage available.

3—It is used to measure inside as well as outside diameters and thicknesses, all to the same high standard of accuracy.

4—It does not wear out of adjustment—no gears, levers, knife edges or sliding friction in its magnification mechanism.

5—It is sturdy as well as sensitive—a half ton load will not break the gaging element or gaging mechanism.

6—It is self contained—no auxiliary equipment needed.

7—Solid vibrationless construction—may be used out in the plant.

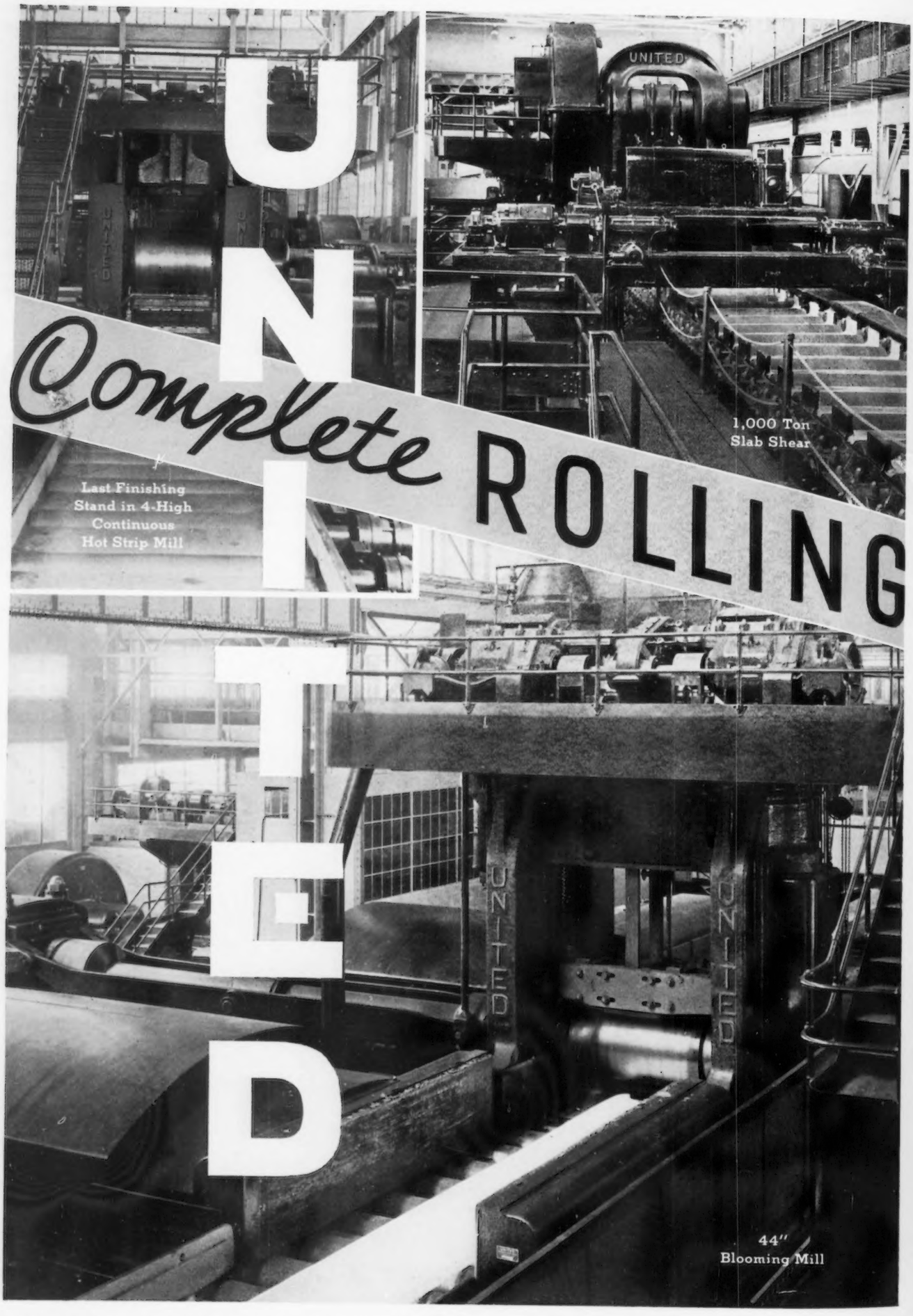
8—Available in magnifications from 1,000 to 10,000.

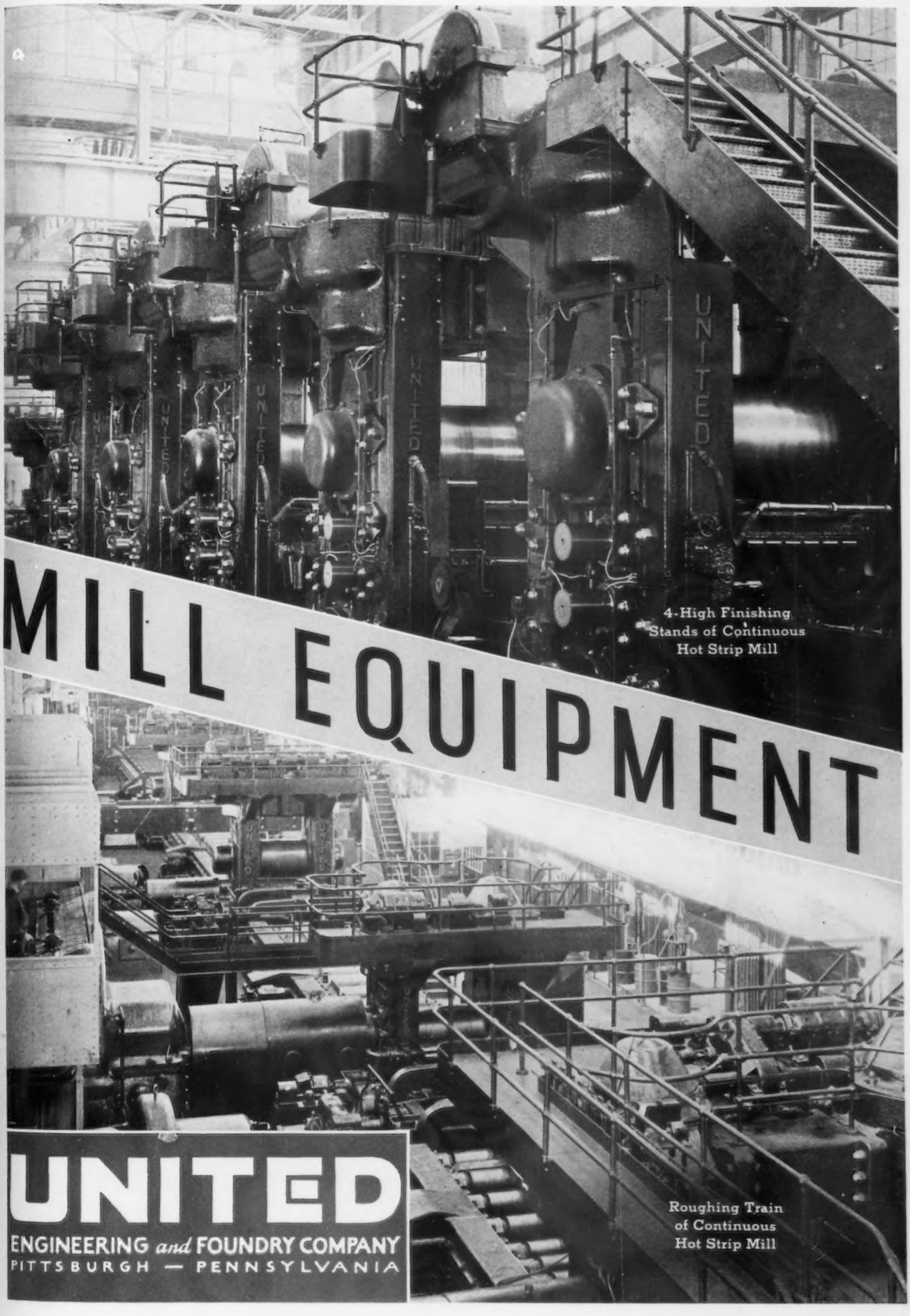
Write for detailed information on your own inspection gaging problems.

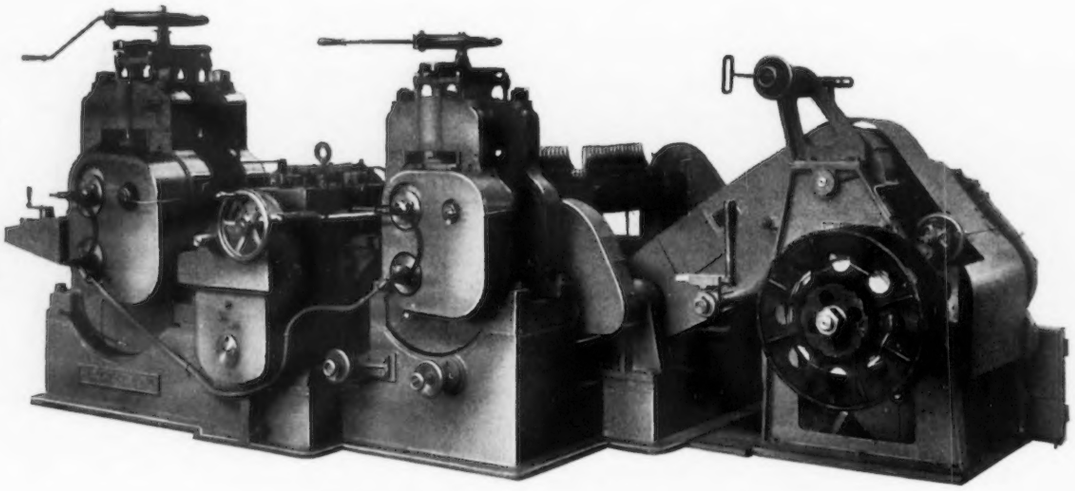
MASTER GAGEMAKERS

The **SHEFFIELD GAGE CORPORATION**

Dayton • Ohio • U. S. A.


UNITED
Complete ROLLING
1,000 Ton
Slab Shear
Last Finishing
Stand in 4-High
Continuous
Hot Strip Mill
UNITED
UNITED
UNITED
44"
Blooming Mill


MILL EQUIPMENT
4-High Finishing
Stands of Continuous
Hot Strip Mill
Roughing Train
of Continuous
Hot Strip Mill
UNITED
ENGINEERING and FOUNDRY COMPANY
PITTSBURGH — PENNSYLVANIA



Precision Tandem Rolling and Edging Mill With Universal Traverse Winder And Torrington Mechanical Lubricators

Westinghouse Electric and Manufacturing Co. uses the equipment illustrated for the accurate rolling and edging of flat copper wire with special edge radii.

The product is for the manufacture and assembly of coils for transfomers, motors and generators.

A complete range of Precision Tandem Mills fully equipped with anti friction bearings available.

We are specialists in the design and building of rolling mill, tube and wire mill auxiliary machinery.

Torrington Mechanical Lubricators provide continuous positive lubrication starting and stopping with machine.

Detailed specifications sent on application.

The Torrington Mfg. Co.
Torrington - Conn, U.S.A.
44 Franklin St.

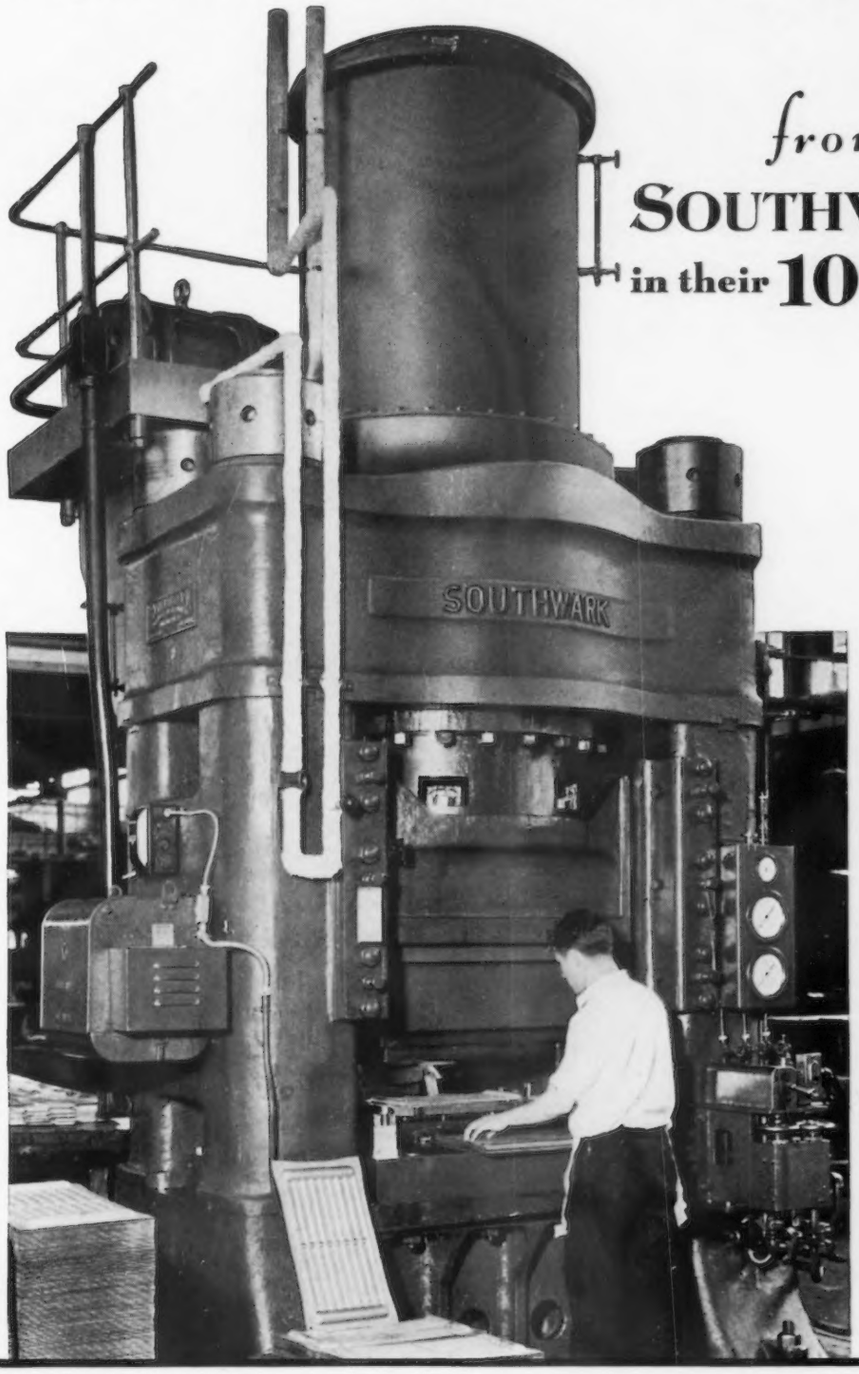
Congratulations...

to WESTINGHOUSE on their 50th Birthday

from

SOUTHWARK

in their 100th year



WESTINGHOUSE 1886 W 1936 GOLDEN JUBILEE

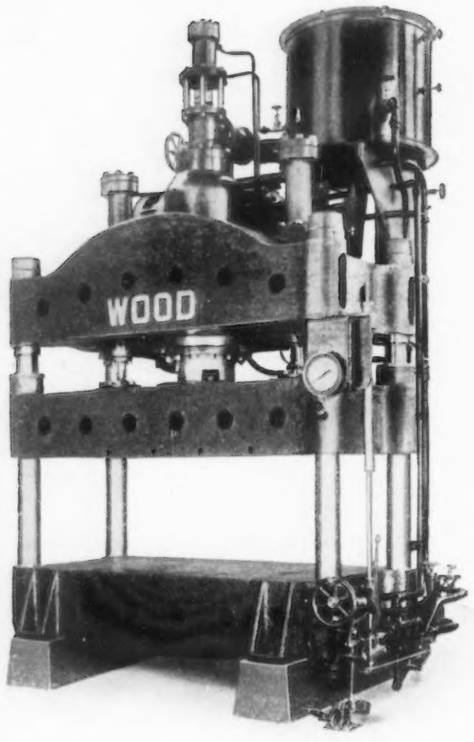
SOUTHWARK CENTENARY 1836 • 1936

Southwark HYSPEED Hydraulic Press for forming, drawing, etc., in use at Westinghouse . . . This is the type of press being widely adopted by leading metal fabricators because it combines the inherent flexibility and ease of control of the hydraulic press with the high production rate of mechanical presses.

BALDWIN-SOUTHWARK CORPORATION, SOUTHWARK DIVISION PHILADELPHIA

DIFFICULT PRESSWORK

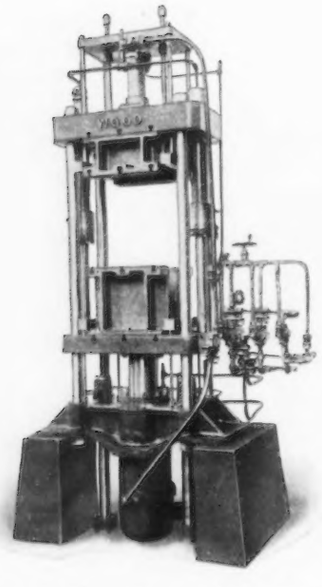
Made Easy



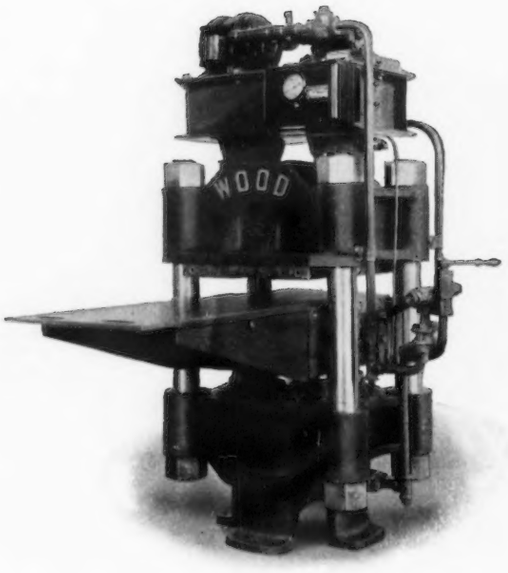
HydroLectric metal-forming press for airplane parts.

Wood hydraulic and HydroLectric presse have the extra precision, simplicity, speea, and sturdiness which mean higher production-schedules with fewer rejects. They have an outstanding record in working metal, rubber, fibre and plastics, and in extremely specialized press operations of every nature.

An engineering staff fully competent to design the most efficient machinery for your particular production problem, and modern shops whose origins reach almost to the beginning of the hydraulic press industry, are yours to command. Please write us concerning any specific problem.



Semi-automatic molding press for the plastic industry.



HydroLectric matrix press for the printing industry.

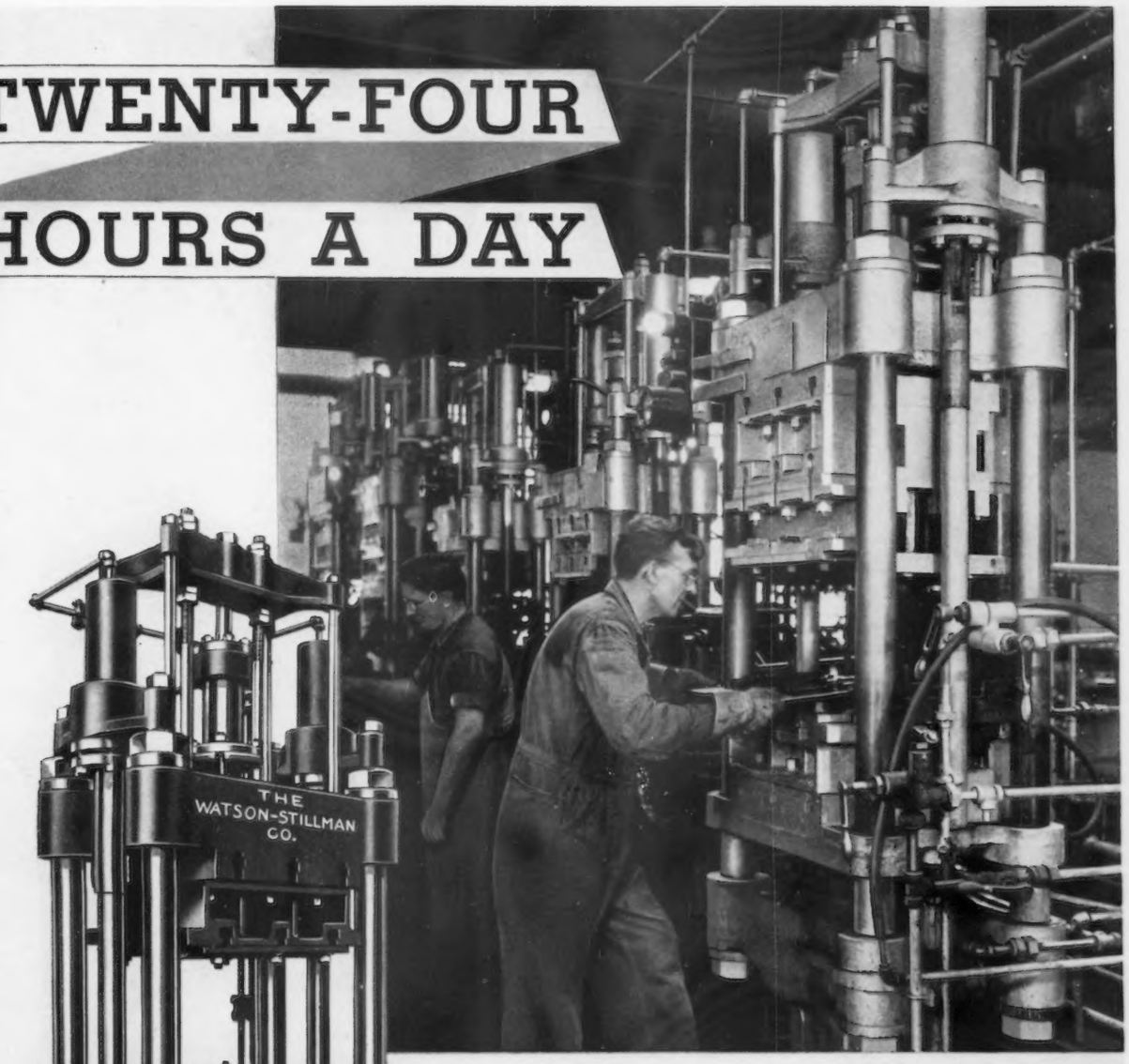


Die-sinking or grinding-wheel forming press.

R. D. WOOD CO.

400 CHESTNUT ST., PHILADELPHIA, PA.

TWENTY-FOUR HOURS A DAY



Twenty-four hours a day Watson-Stillman Semi-Automatic Molding Presses are in operation at the East Pittsburgh plant of the Westinghouse Company. This great manufacturer has installed more than fifty presses of this type, for the molding of plastics, with most gratifying results.

Builders of complete hydraulic plants including valves, pumps, accumulators, intensifiers and presses for a broad range of manufacturing operations, Watson-Stillman engineering experience in this specialized field is at your service.

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HYDRAULIC MACHINERY & EQUIPMENT
103 ALDENE ROAD, ROSELLE, N. J.

THERE ARE MANY BARRETT CENTRIFUGALS IN WESTINGHOUSE PLANTS



SCIENTIFIC PROCESSING

FORCE—SKILL—SPEED

CENTRIFUGAL

OIL EXTRACTORS—TYPHOON WASHERS
CYCLONE DRYERS—FILWHIRL ENAMELERS
HYDROSTATIC IMPREGNATORS
WHIZO GALVANIZERS

RECOVER YOUR CUTTING OIL FULLY

WASH—DRY—ENAMEL
IMPREGNATE—MIX—SEPARATE

CENTRIFUGALS ONLY SINCE 1860

THE LEON J. BARRETT CO.

CENTRIFUGAL MACHINERY
RESEARCH & ENGINEERING
1650 GRAFTON ST., WORCESTER, MASS., U. S. A.

THOMAS FLEXIBLE COUPLINGS

Keeps 'em Running Every Day in the Year

Dependable operating performance is again proven by its extensive use by

Westinghouse

Over a term of more than fifteen years representing millions of H.P.

Operates without destructive back-lash, friction, point or line contact, noise, wear or lubrication, yet costs no more than the coupling made from gears, jaws, blocks, rungs and other fast wearing back-lash makeshifts.

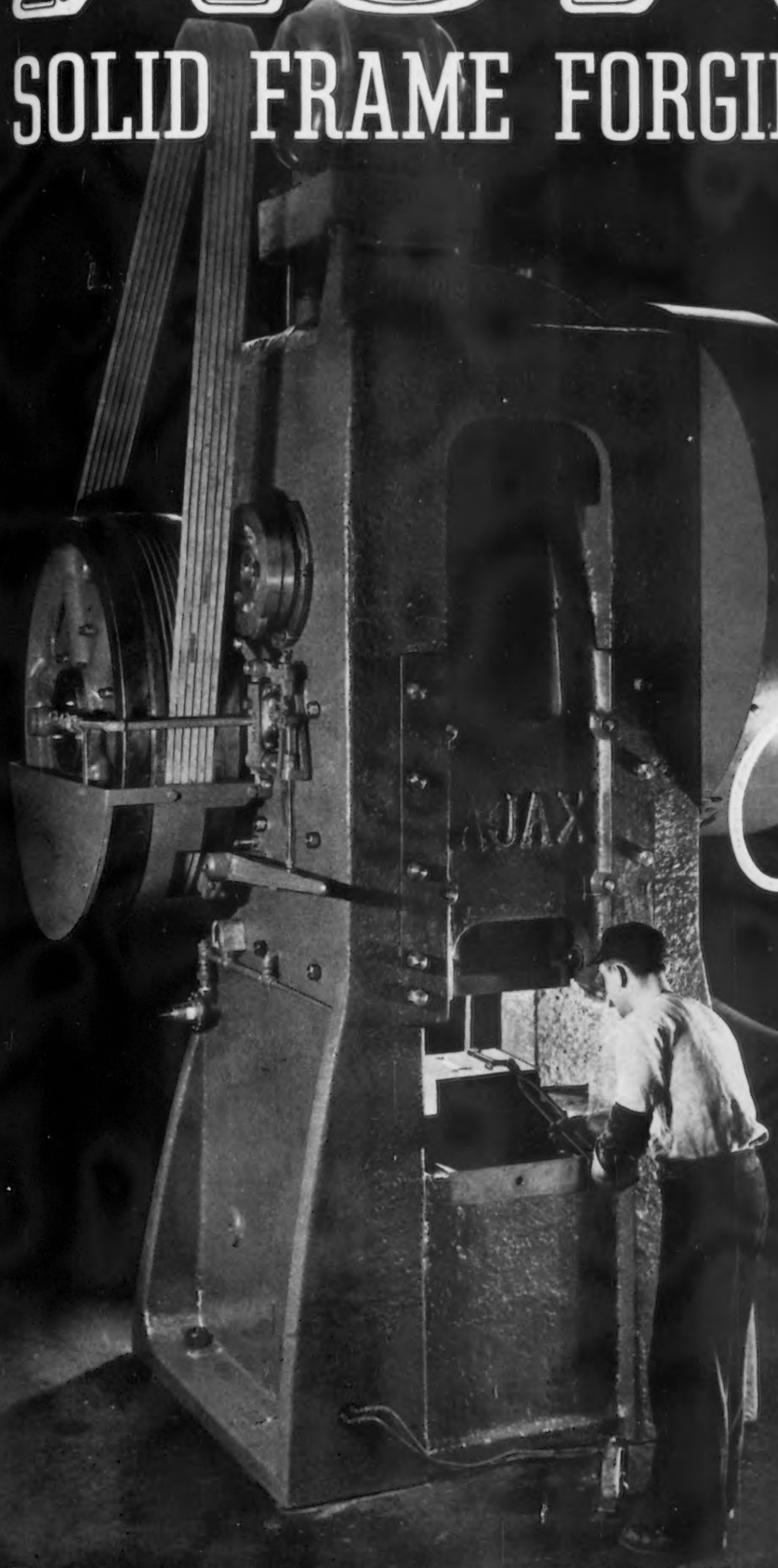


Shall we send you that helpful Thomas catalog?

THOMAS FLEXIBLE COUPLING COMPANY
WARREN, PA.

AJAX

SOLID FRAME FORGING PRESSES



Air Clutch

OPERATED

For accurate hot forging and precision hot and cold coining of ferrous and non-ferrous pieces. Sizes 500 ton to 1800 ton. Full details on request.

THE AJAX MANUFACTURING COMPANY

EUCLID BRANCH P. O., CLEVELAND • CHICAGO OFFICE: 621 MARQUETTE BLDG.

Westinghouse

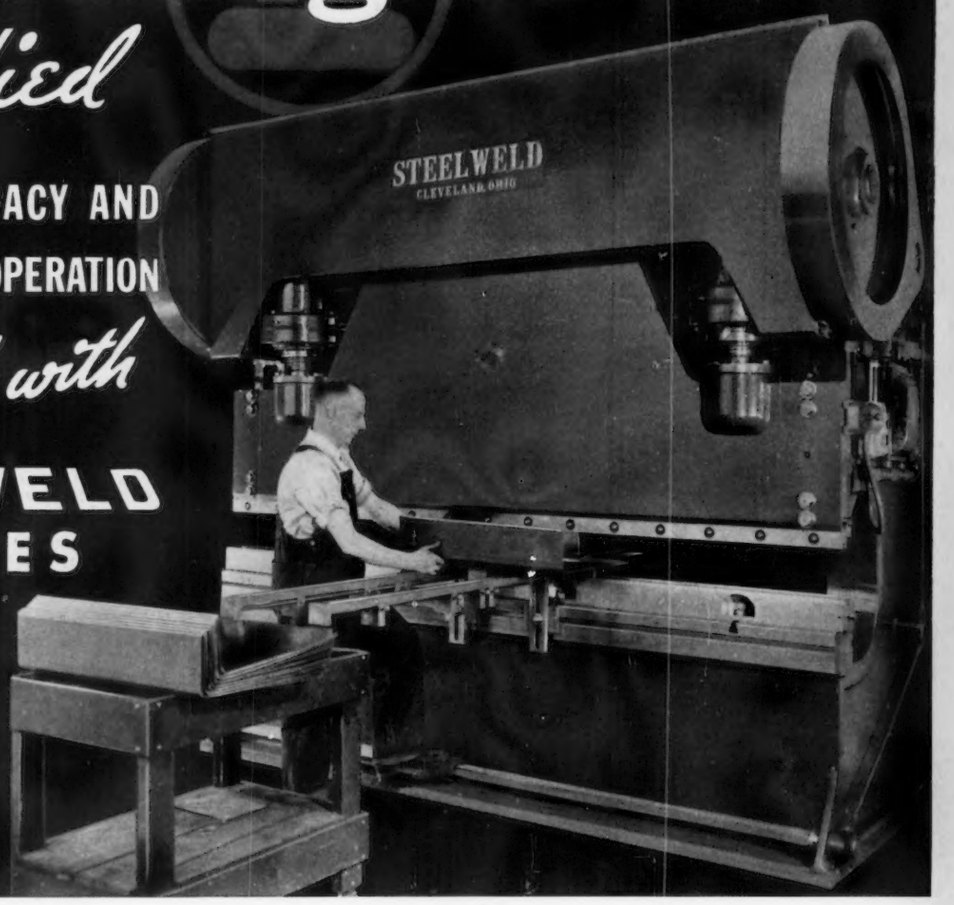
specified

EXTREME ACCURACY AND UNINTERRUPTED OPERATION

★

gets both with

STEELWELD BRAKES



★ Easy installation, floor mounting without pits, easy adjustment for fadeout work, accurate die settings made with micrometric accuracy, anti-friction bearings and a much reduced motor requirement—these are but a few of the exclusive features found only in Steelweld design.

Of greater importance to operating men interested in eliminating breakdown and production delays is the mono-steel construction of the bed and side frames. It minimizes deflection—holds the ram and bed parallel to within .006 inches even under full loading. Generous allowance for overloading and an accurate balance between frame rigidity and delivered power stalls the drive before the brake can jam tight. Steelweld Brakes need never be "cut apart"—will not tie up production. You simply reverse the motor and engage the clutch. The ram pulls out.

More complete details of the new construction that is demonstrating its superiority at Westinghouse and other representative plants will be sent on request. Write for descriptive literature.

THE STEELWELD MACHINERY CO.
E. 70th St. at Machinery Ave., Cleveland, Ohio.

REPRESENTATIVES AND DISTRIBUTORS IN THE PRINCIPAL CITIES

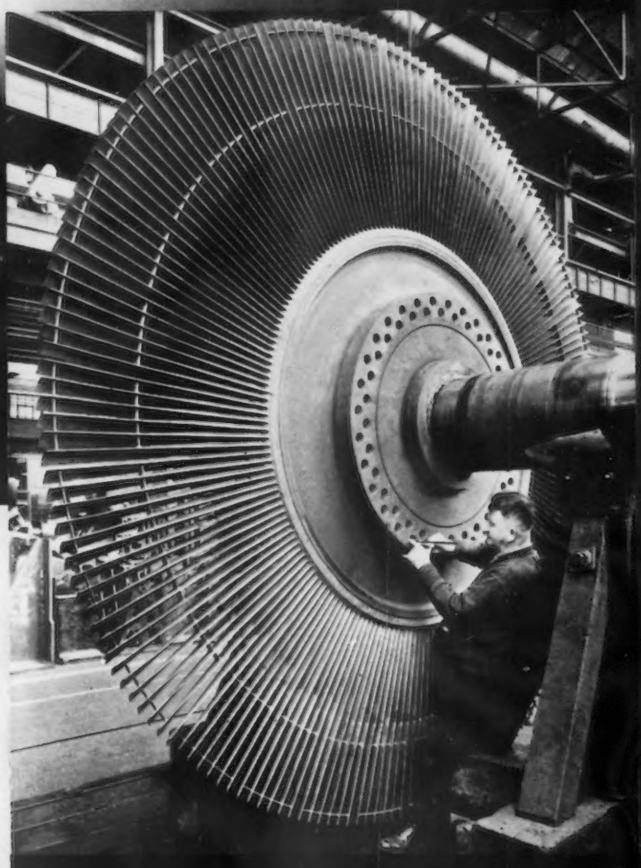
STEELWELD
PRESS BRAKES

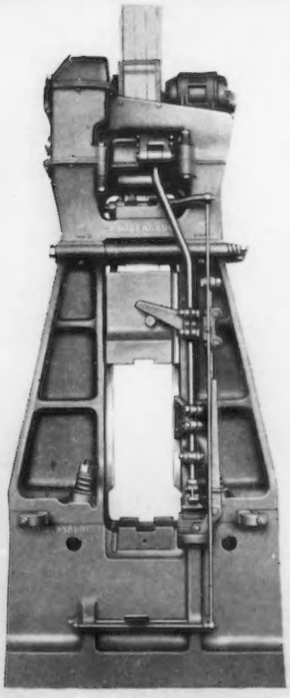
CHAMBERSBURG

HAMMERS • PRESSES •



WHIRLING through steam-charged space at a speed of four miles a minute, the blades of this Westinghouse steam turbine must be in perfect balance. This means absolutely accurate forgings, for the blades receive no machining except at the end where they are keyed to the rotor. Naturally Westinghouse uses Chambersburg Hammers in forging these blades.



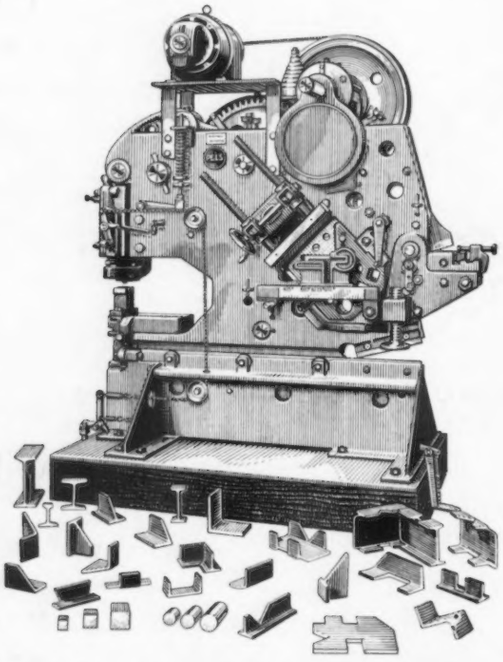


Write for bulletins on Chambersburg Board Drop Hammers, Steam Drop Hammers, Single and Double Frame Forging Hammers, Hydraulic and Mechanical Presses and Cecolloy Castings.

CHAMBERSBURG
ENGINEERING COMPANY
CHAMBERSBURG · · · PENNA.

Just a Few Machines Made by PELS

All With GUARANTEED STEEL PLATE FRAMES

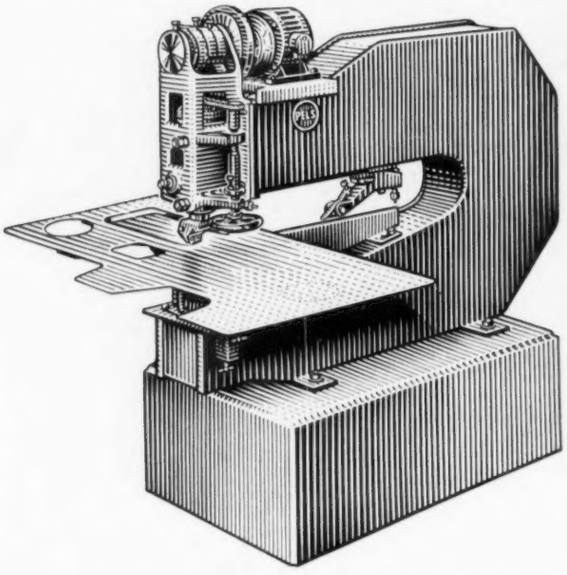


PELS *Combination*

PUNCH
PLATE SHEAR
BAR and ANGLE SHEAR
With Built-in COPER and NOTCHER

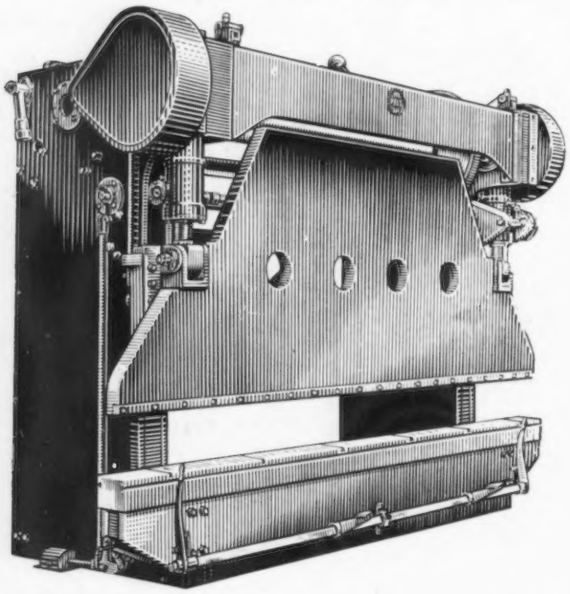
A Complete Fabricating Shop in One Small Unit

Built In EIGHT *Sizes* — NO CHANGE OF SET-UP



PELS PRESS BRAKES

With and Without Extended Ram and Bed Plates
Make Perfect Bends
Built Up to Heaviest Capacity



PELS METAL SHEAR & NIBBLER

Any kind of inside and outside cuts made without pre-punching.

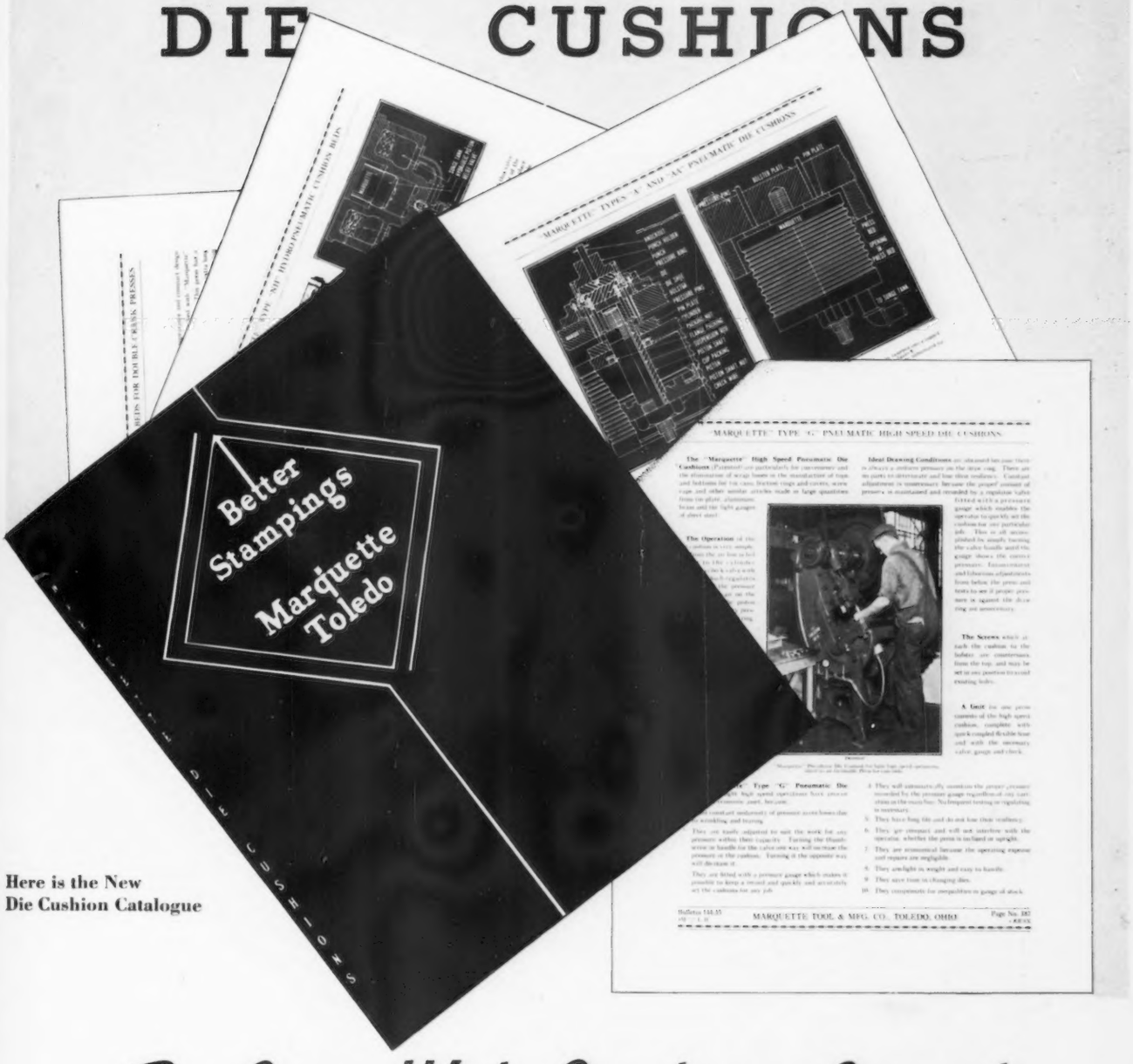
THROATS 42″ and 50″ deep
Built for 1/8″, 5/32″ and 1/4″ capacity

EXCLUSIVE MANUFACTURE

PUNCHES	BILLET SHEARS
SHEARS	PRESS BRAKES
ANGLE SHEARS	BENDING ROLLS
GATE SHEARS	HEAVY PRESSES

HENRY PELS & CO., INC. **90 WEST ST., NEW YORK, N. Y.**

MARQUETTE
DIE CUSHIONS



Here is the New Die Cushion Catalogue

Do Away With Breakage Losses!

SAVE your set-up men time, and avoid breakage scrap or wasters in production. The latest design in Marquette Die Cushions will accomplish the results for you. Present your metal drawing problems to the nearest Bliss representative.

MARQUETTE TOOL & MFG. CO., Toledo, Ohio
A Division of
E. W. BLISS COMPANY

Presses	Rolling Mills	Can Machinery
Brooklyn, N.Y.	Chicago, Ill.	Detroit, Mich.
Cleveland, Ohio	Philadelphia, Pa.	Boston, Mass.
New Haven, Conn.	Rochester, N.Y.	Salem, Ohio
Hastings, Mich.	Loudon, England	Paris, France

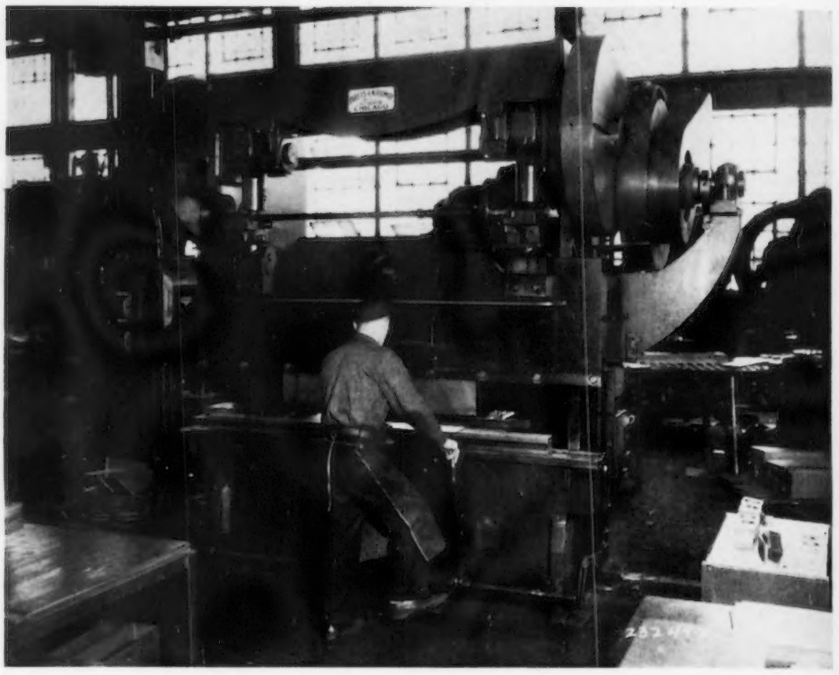
BLISS

CHICAGO STEEL PRESS BRAKE

Illustration of Chicago Steel Press Brake at East Pittsburgh Plant of Westinghouse Electric & Mfg. Co.

Numerous Chicago Machines Are in Use in All Westinghouse Plants.

Chicago Steel Brakes, Presses and Shears Are the Perfected Result of Thirty-five Years Experience in Building Steel Constructed Sheet Metal Working Machinery.

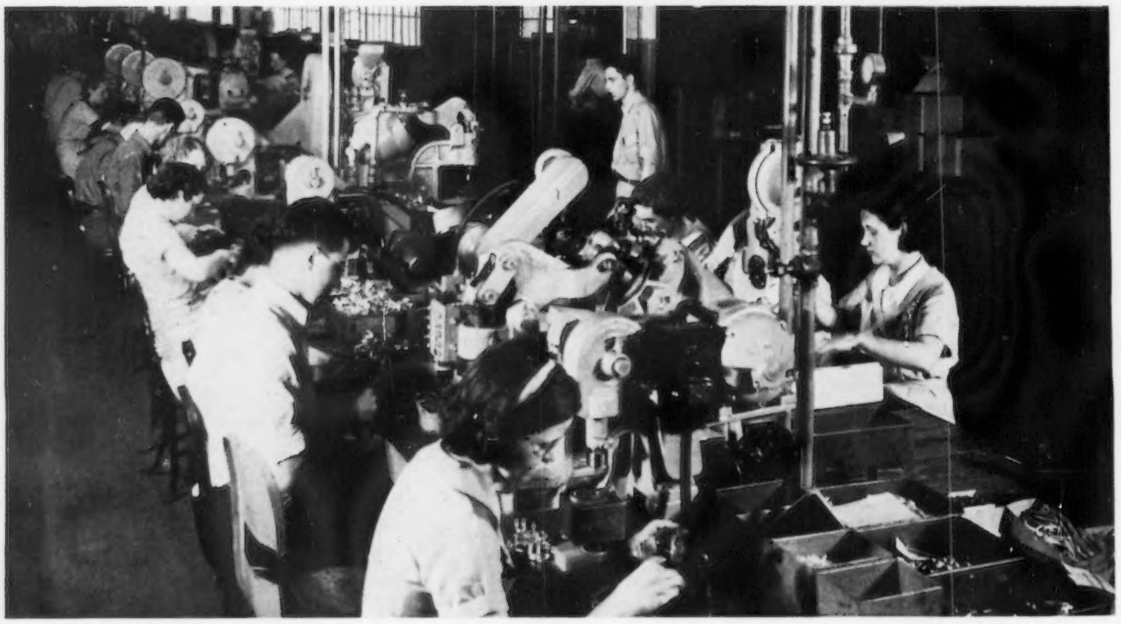


DREIS & KRUMP MFG. CO., 7430 LOOMIS BLVD., CHICAGO

TO GUARANTEE WESTINGHOUSE QUALITY FOUND IN WESTINGHOUSE EQUIPMENT AND TO MAINTAIN WESTINGHOUSE PRESTIGE

EIGHTY-TWO 'RIVETERS BY TOWNSEND' ARE EMPLOYED

The illustration shows a few of these in one Westinghouse department in their Mansfield, Ohio, plant.



H. P. TOWNSEND MFG. CO., HARTFORD, CONN., U. S. A.

Alexander, Birmingham, England;—Fenwick, Paris;—Schinz, Zurich;—Andrews & George, Tokyo.



In WESTINGHOUSE *Plants*

Kane & Roach Machines are used by Westinghouse in its achievements and march toward great accomplishments. » The equipment illustrated includes Angle Bending Rolls, both Horizontal and Vertical Types; Double Housing Wrapping Type Bending Rolls, for small motor frames; and Cold Roll Forming Machines. » Congratulations to you, Westinghouse, on your 50th Anniversary. This is our 49th year.

KANE & ROACH
INCORPORATED
Syracuse, New York
Established 1887

SAFETY, STRENGTH,

Believing that a product is known by the companies it serves, Niagara is proud of its long service to the Westinghouse Electric and Manufacturing Company. Niagara presses, shears and machines for plate and sheet metal work are playing an important part in the progress of modern industry. Write for bulletins covering the complete line.

Do You Know About These Important and Exclusive Improvements?

Frames scientifically designed for strength and rigidity

Instant Acting Clutches with Built-in Single Stroke Mechanism for speed with safety

Slide with Breech Block Die Clamp

Double and Triple "V" Gibs

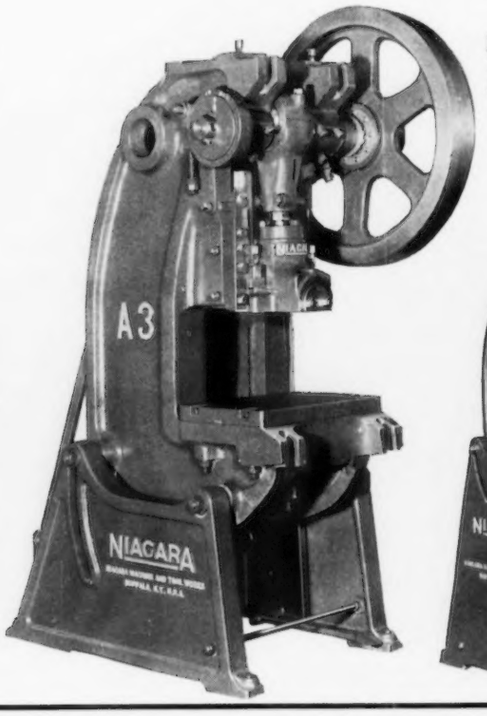
Anti-Friction Back Gear

Accessible One-Man Inclining Mechanism

Bearings split at 45 degree angle thus transmitting entire thrust direct to frame

On Niagara Master Series "A" Inclinable Open Back Presses

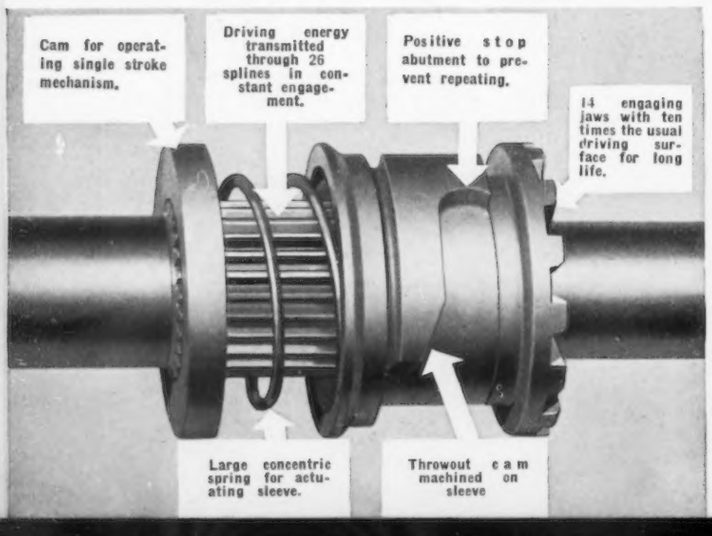


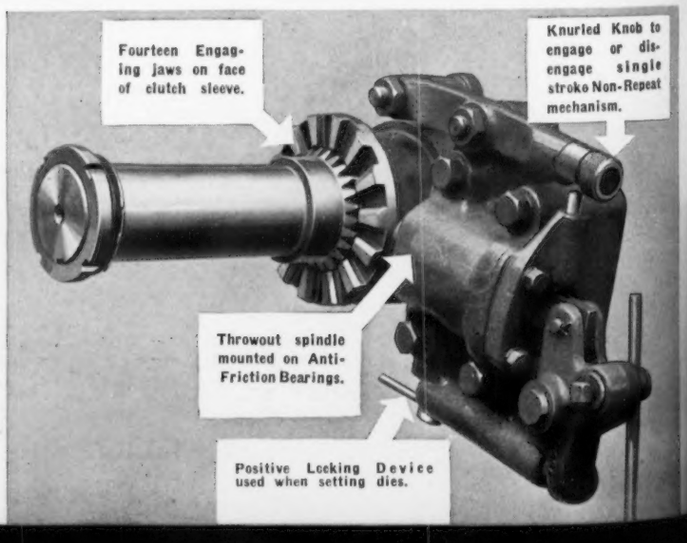




Built in Sizes from 1¼" to 5½" Diameter Shafts

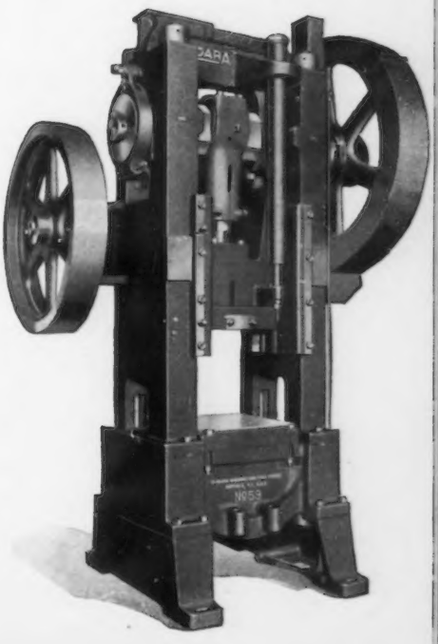
NIAGARA SLEEVE CLUTCH with Built-in Single Stroke Mechanism





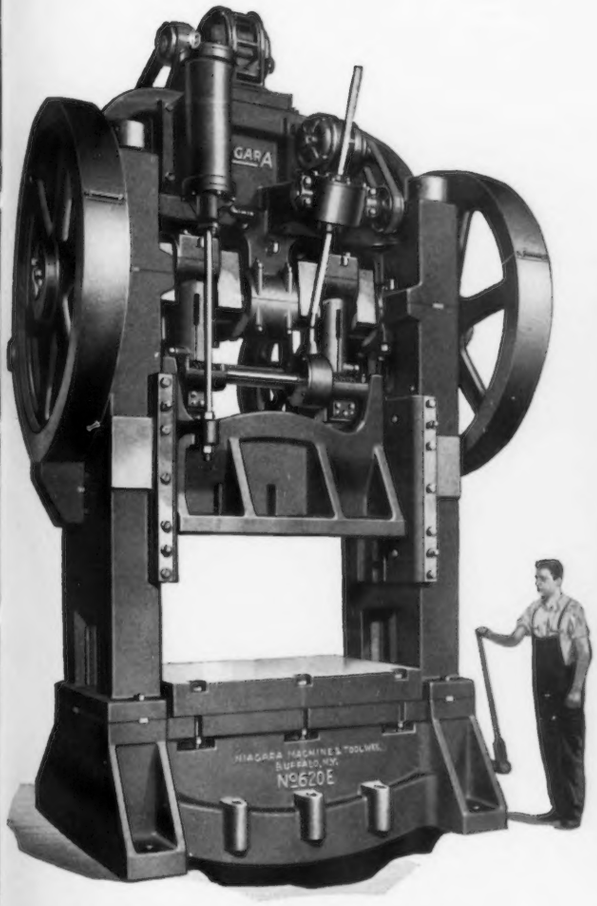
H, RIGIDITY, ECONOMY

You Get them ALL with NIAGARA PRESSES & SHEARS



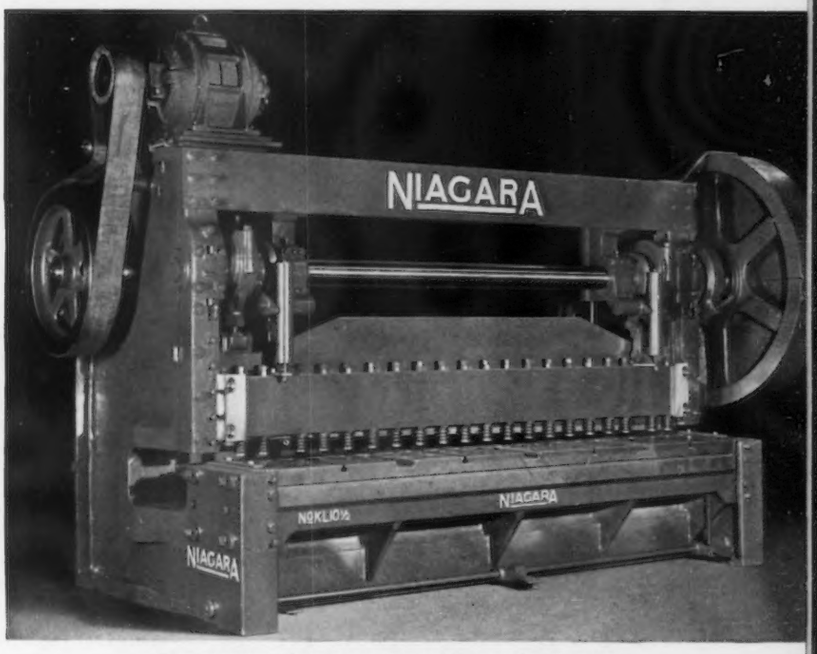
SINGLE CRANK PRESSES

Niagara Single Crank Presses are built in a complete range of sizes with standard construction and special modifications for every requirement.



DOUBLE CRANK PRESSES

The No. 620 Double Crank Press shown above is just one of many sizes for heavy duty work requiring medium and large sized dies. Niagara engineering service is at your command for assistance in selecting the most economical machine for your requirements.



POWER SQUARING SHEARS

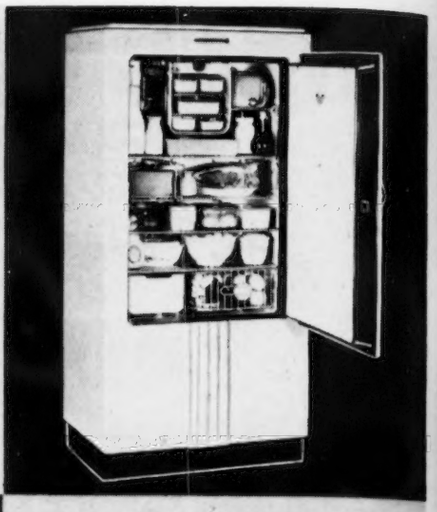
The photograph above shows just one of the complete line of Niagara Power Squaring Shears built in capacities ranging from the lighter gages up to and including ¾ inch in all cutting lengths. Write for information on the latest developments and improvements in Power Squaring Shears.

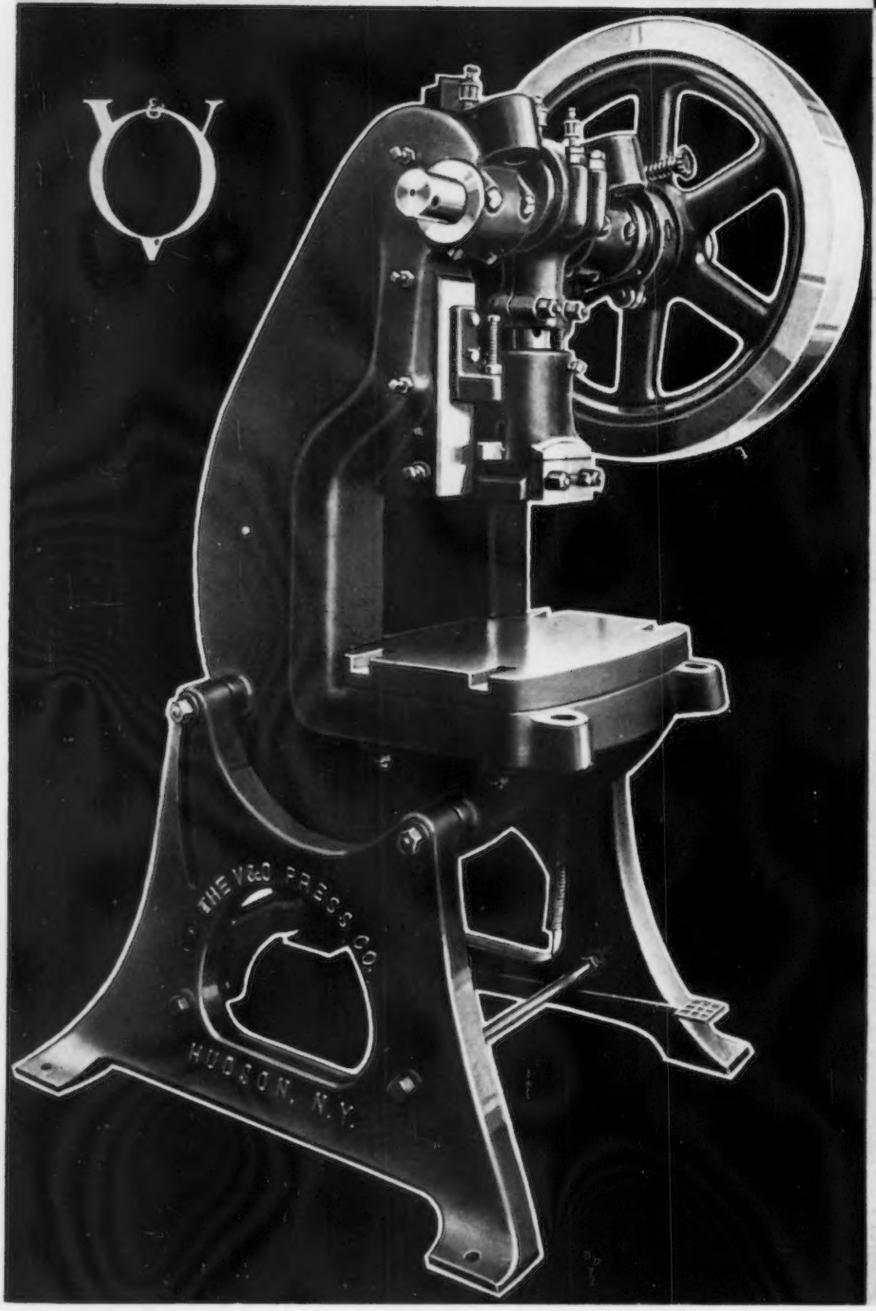
NIAGARA

NIAGARA MACHINE AND TOOL WORKS, BUFFALO, N. Y.

NEW YORK . . . DETROIT

Quality KNOCKS AT YOUR DOOR





Highest quality is something which has always been built into V & O Power Presses. This applies to the materials, the workmanship, the outstanding features of design and construction, and that quality is reflected in the low cost operation of V & O Presses.

Among the many users of V & O Presses are the manufacturers of quality refrigerators. And like the refrigerators, the price of V & O Presses is economically within reach of buyers who would prefer the best in presses but who perhaps have the notion that they are too costly.

Ask us for information about V & O before you buy your next press.

THE V&O PRESS COMPANY
HUDSON, N. Y.

AGENTS:

Henry Prentiss & Co.	New York, Hartford, Boston, Syracuse, Buffalo
Marshall & Huschart Machy. Co.	Chicago, Milwaukee
Sterling-French Machy Co.	Detroit
George L. Lind	Philadelphia
Millholland Sales & Mach. Co.	Indianapolis
William K. Stamets	Pittsburgh, Cleveland
Arthur Jackson Mach. Tool Co.	Toronto and Montreal
Elliott & Stephens Machinery Company	St. Louis
D. S. Mair Machinery Corporation	Houston and Dallas, Texas
Tidewater Supply Co., Inc.	Norfolk, Va.; Columbia, S. C.; Asheville, N. C.

Congratulations TO WESTINGHOUSE ON 50 YEARS



Part of the Westinghouse Die Storage. More than 15,000 Danly Die Sets are in active storage here today.

Beauty-Quality-Accuracy-Low Cost DANLY DIE SETS AT WESTINGHOUSE

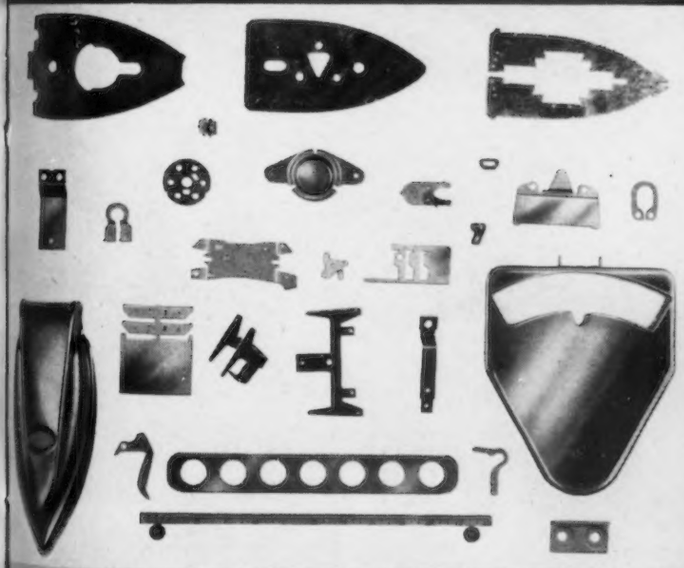
● The American Housewives, the users of Westinghouse refrigerators, ranges, irons, waffle irons and other household appliances, demand beauty and quality, which mean accuracy in manufacture.

American Competition demands low production costs.

Both demands are met to a very large degree by the use of stampings, also produced to a very large degree in Danly Die Sets. Accuracy is obtained through proper tooling at a reasonable first cost and retained for an indefinite period without expensive maintenance on tools or "hold-ups" on equipment.

By using Danly Die Sets Westinghouse says: "We have not only accomplished this, but have standardized designs, methods of building, shortened delivery dates on both new tools and repairing breakdowns, and also reduced tool building stock to a minimum."

DANLY MACHINE SPECIALTIES, Inc.
2128 South 52nd Avenue • • Chicago, Illinois



Above—A few blanks of the stampings produced by 15,000 Westinghouse Dies in 15,000 Danly Die Sets in annual production.

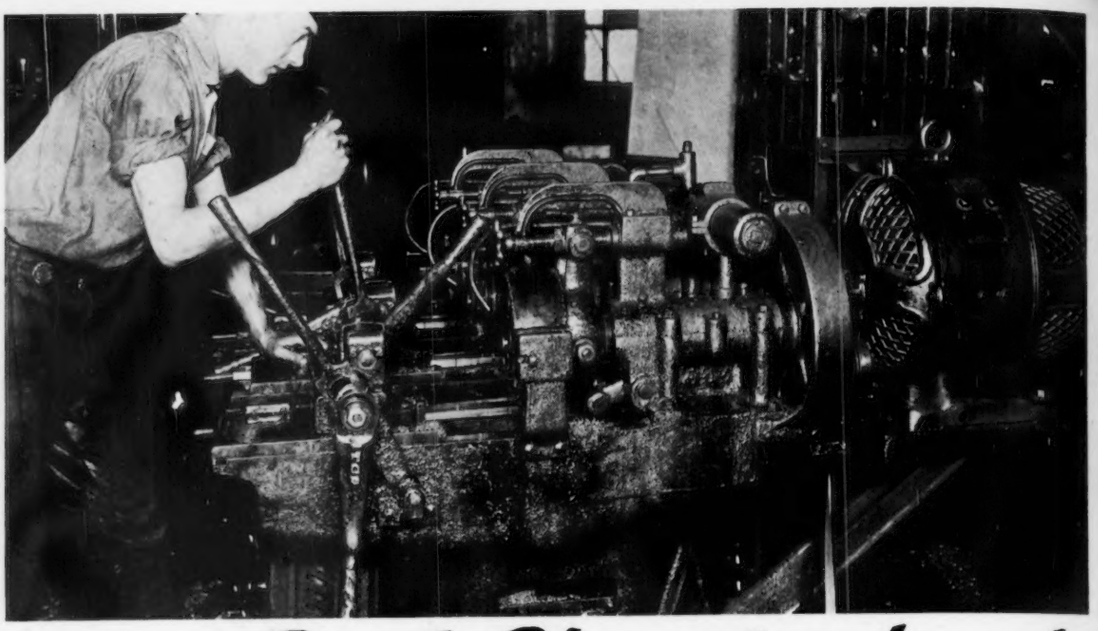
At Right—A Westinghouse range platform die; its life is protected; its operating accuracy increased by a Danly Large Die Set.



DANLY DIE MAKERS' SUPPLIES

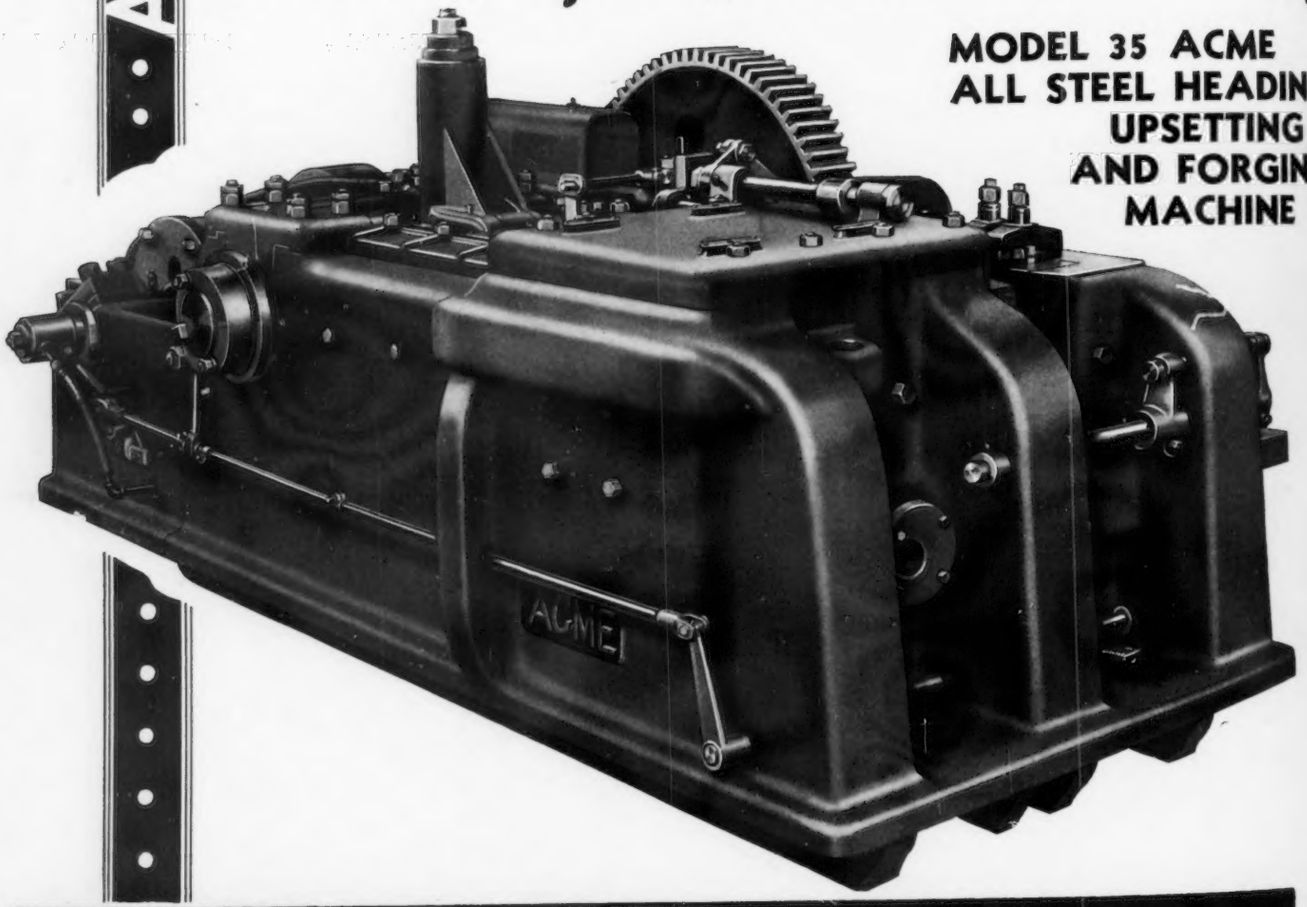
Best Wishes TO WESTINGHOUSE FOR THE CENTURY

ACME BOLT THREADERS CELEBRATE



Acme Triple Threaders have long se

MODEL 35 ACME ALL STEEL HEADING UPSETTING AND FORGING MACHINE



THE ACME MACHINERY CO.
CLEVELAND, OHIO, U.S.A.

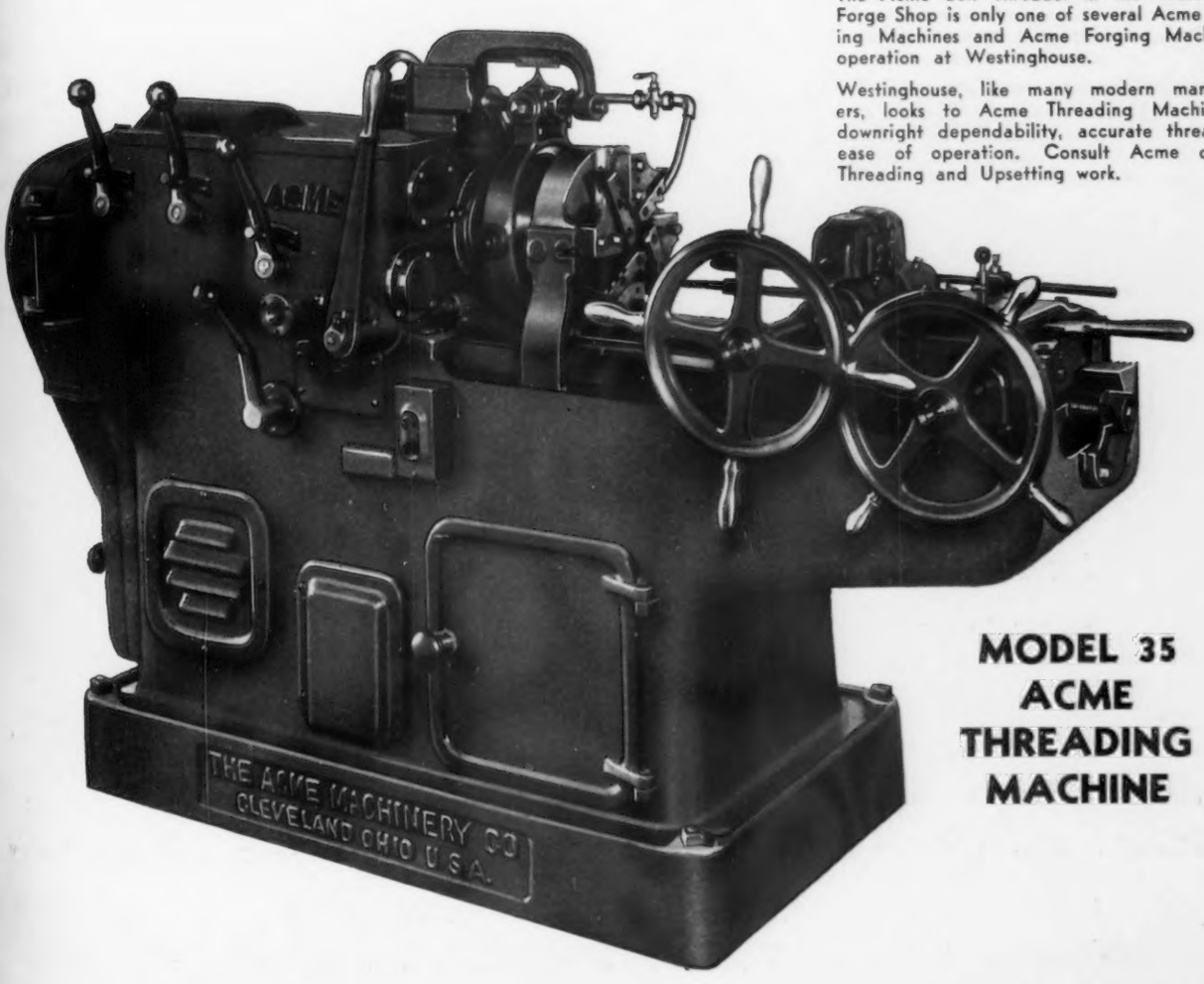
TE WITH WESTINGHOUSE . . .

Class "A" ACME Bolt Cutter in Forge Shop at WESTINGHOUSE

long service records at Westinghouse

The Acme Bolt Threader in the Westinghouse Forge Shop is only one of several Acme Threading Machines and Acme Forging Machines in operation at Westinghouse.

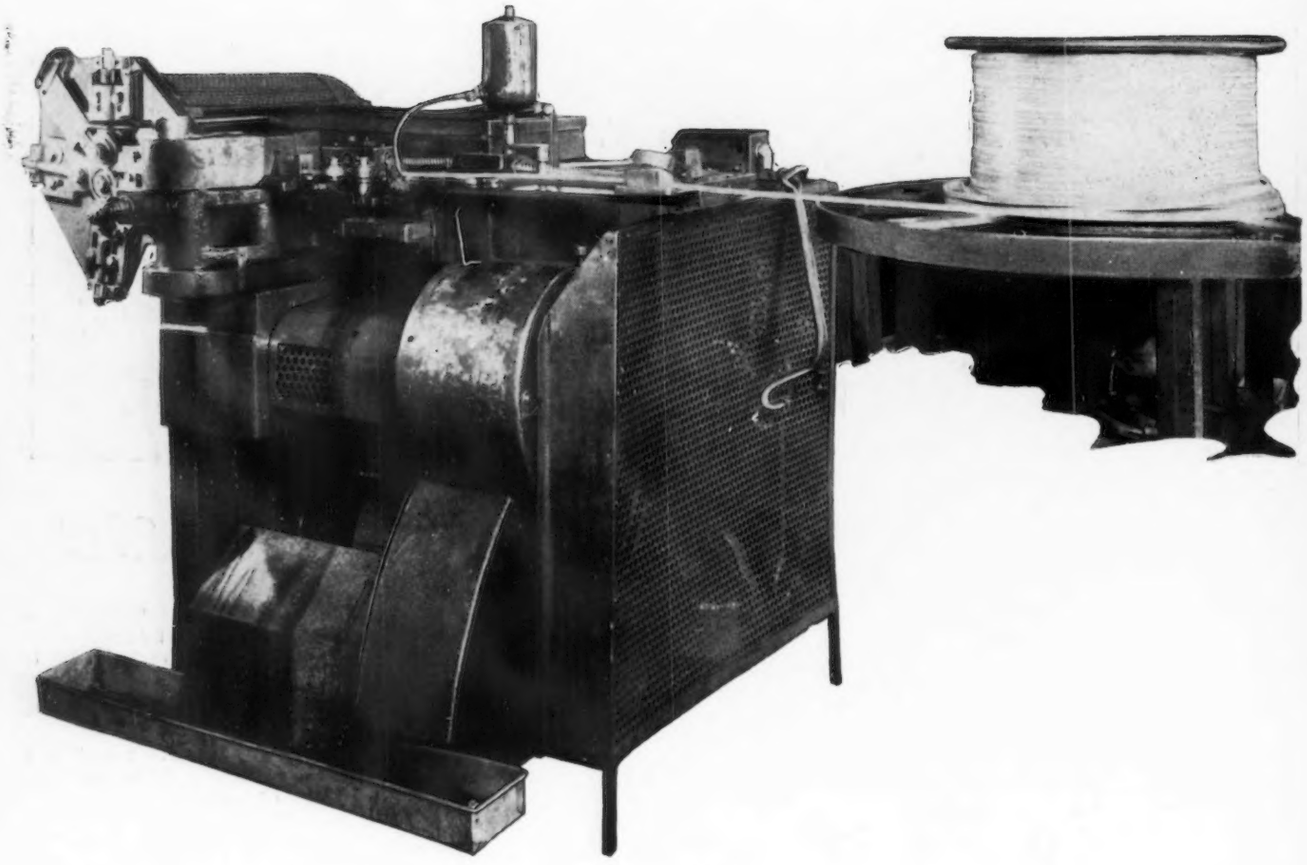
Westinghouse, like many modern manufacturers, looks to Acme Threading Machines for downright dependability, accurate threads and ease of operation. Consult Acme on your Threading and Upsetting work.



MODEL 35 ACME THREADING MACHINE

COILING FLAT COPPER STRIP

INTO RINGS AT RATE OF 10,000 PER DAY



Above view was taken at the Westinghouse Electric & Mfg. Co.'s East Springfield, Mass., plant. They show a special Sleeper & Hartley strip bending machine coiling 5/16" wide by .063 thick copper strip into resistance rings for refrigerator fan motors. This machine will coil up to 11/16" widths.

"THE MACHINES THAT PUT THE 'RINGS' IN SPRINGS"

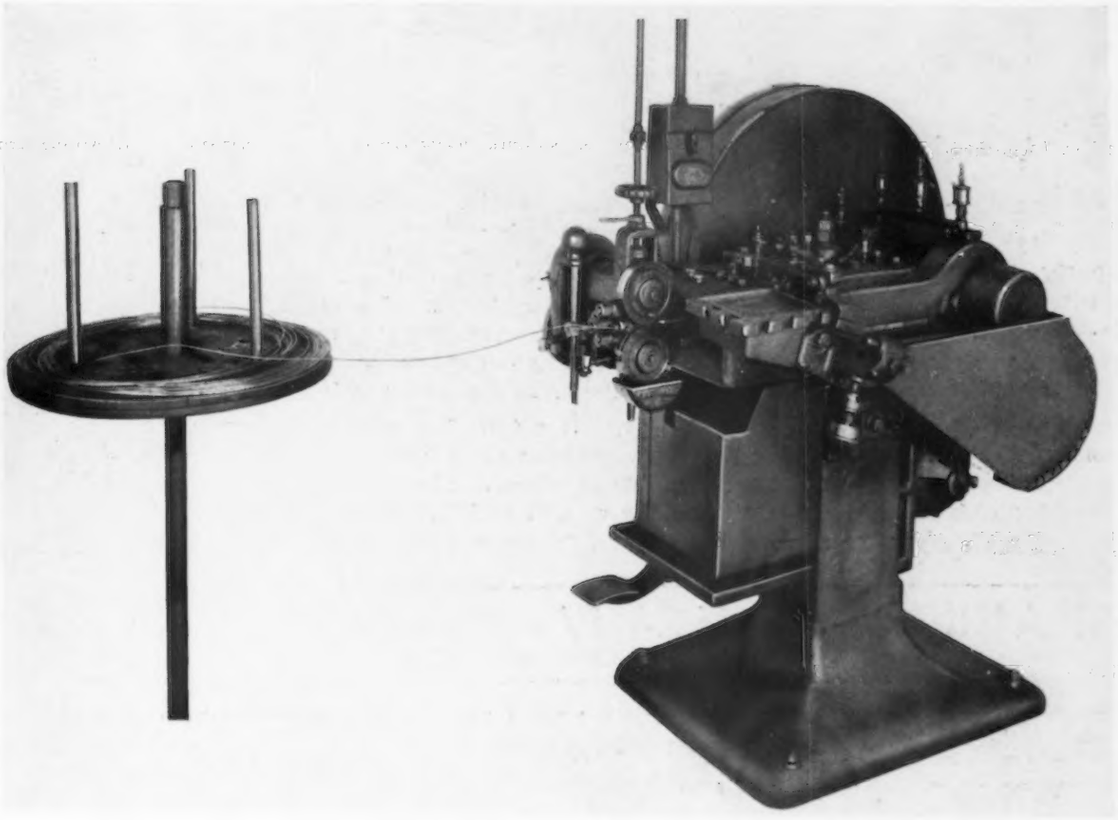
SLEEPER & HARTLEY, INC.

DESIGNERS & BUILDERS OF
SPRING MAKERS MACHINERY—WIRE MILL EQUIPMENT

WORCESTER, MASSACHUSETTS, U. S. A.

MANVILLE COLD FORGING

for Westinghouse Tubes



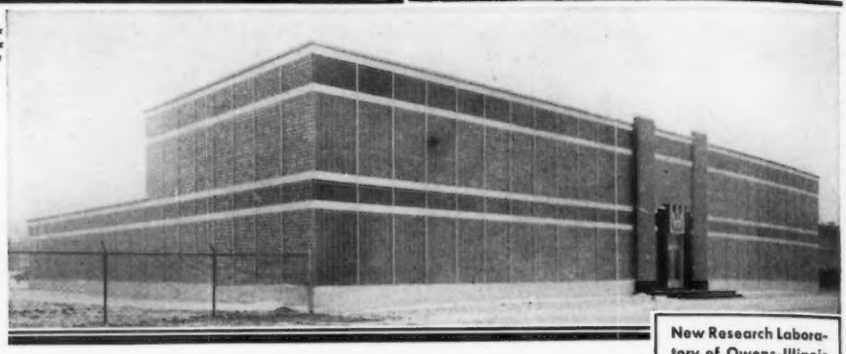
This Manville Double-Stroke Solid Die Header turns out 10,000 side pins an hour for Westinghouse Radio Tubes. Using brass wire in coils, the Manville Cold Forging process gives Westinghouse speed in operation, economy of materials, and a fine finished product.

Manville is proud to have Westinghouse among the distinguished manufacturing companies using its cold forging process. Manville engineers will be glad to see whether the advantages of cold forging can be applied to parts or products you make.

MANVILLE MACHINES

E. J. MANVILLE MACHINE CO., WATERBURY, CONN. *Cleveland Office: 1209 Sweatland Bldg.*

An Ultra-Modern Air Conditioning Plant for this Ultra-Modern Windowless Building



New Research Laboratory of Owens-Illinois Glass Co., Toledo—built entirely of translucent glass blocks—no windows.

This building without a single window—constructed entirely of Owens-Illinois glass blocks—is completely air conditioned by a Clarage System designed specially to meet the unique conditions encountered.

Cold well water is the medium employed for summer cooling and dehumidification, effecting a substantial saving in both first and operating costs as compared with the use of a direct expansion refrigerant.

Clarage Vortex Control is installed on the Clarage supply fan. This patented device reduces fan horse-power by more efficiently regulating the volume of conditioned air delivered in accordance with zone needs.

Here is a typical example of Clarage resourcefulness and facilities in meeting any air handling or air conditioning requirement with satisfaction and utmost economy. If you have such a problem, write us!

SPECIFY CLARAGE
for
COMPLETE AIR CONDITIONING
•
VENTILATION
•
HEATING
•
COOLING
•
MECHANICAL DRAFT
•
FANS & BLOWERS FOR INDUSTRIAL NEEDS

CLARAGE FAN COMPANY - KALAMAZOO, MICH.

Sales Engineering Offices In All Principal Cities

PENNSYLVANIA

IT CERTAINLY DOES PAY TO BUY GOOD COMPRESSOR EQUIPMENT!

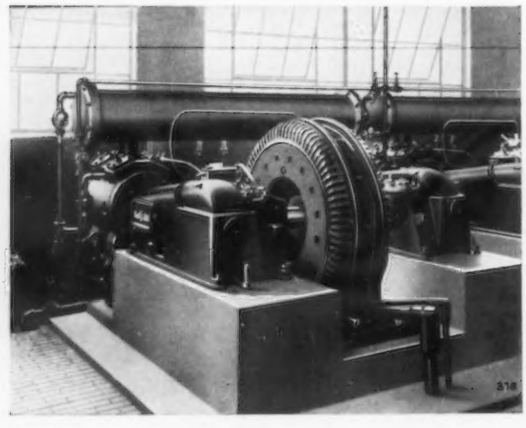


Illustration pictures two PENNSYLVANIA Two-Stage Duplex Synchronous Motor Driven Air Compressors which have been operating on continuous 8-hour-per-day railroad shop service over a period of 11 years. Total cost replacement parts for both compressors, $53.00. A third PENNSYLVANIA duplex compressor in another shop of the same railroad has given 9 years of continuous 16-hour-per-day service at a total cost for replacement parts of $28.00.

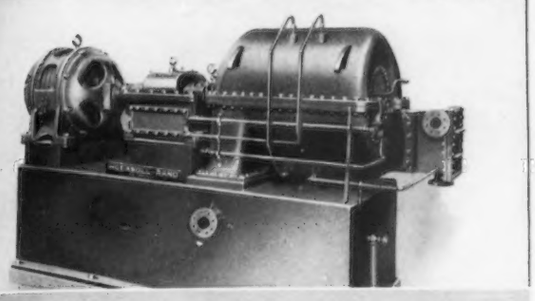
This is but one of many instances where PENNSYLVANIA Duplex Compressors have given equally satisfactory low cost, long-time service.

Send for Bulletin 151-IA

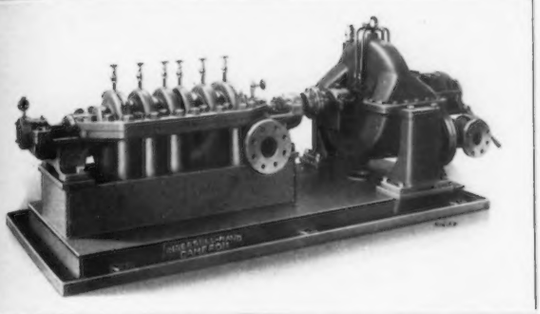
PENNSYLVANIA PUMP & COMPRESSOR COMPANY

MAIN OFFICE AND WORKS, EASTON, PENNSYLVANIA

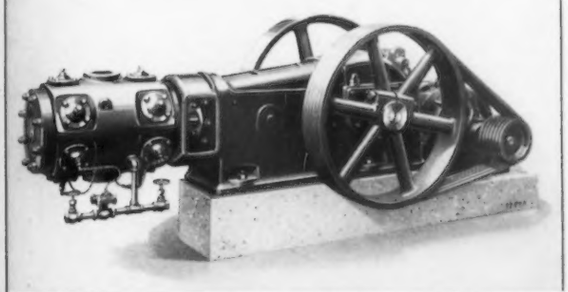
50 *Years of* COÖPERATION



I-R Water-Vapor Refrigerating Units for air conditioning and industrial applications use water as the only refrigerating medium. The centrifugal unit shown above is driven by a 60 hp. Westinghouse motor.



This Cameron 6-stage Class NT Boiler-Feed Pump is coupled to a 75 hp. Westinghouse steam turbine.



Highly-Efficient, Heavy-Duty Single-Stage Class ES Compressors are made in from 10 to 125 hp. sizes. The unit shown is belted to a Westinghouse motor.



Here is a Westinghouse 1250 hp. synchronous motor direct connected to a PRE Gas Compressor.

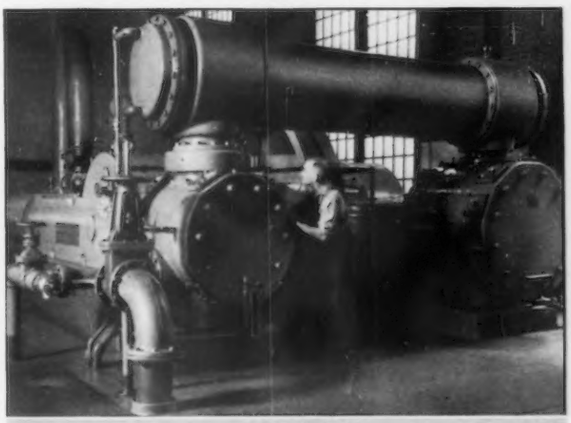
WESTINGHOUSE and other manufacturing leaders are in effect "coöperative specialists" who constantly contribute ideas, research and manufacturing facilities and products to the better solution of industrial problems.

The fifty years of Westinghouse history have been well interwoven with this coöperative service. Ingersoll-Rand, already a strong and going concern in 1886, has had many occasions to share with Westinghouse the privileges and responsibilities of solving industrial problems in air and gas compression, pumping and air-conditioning.

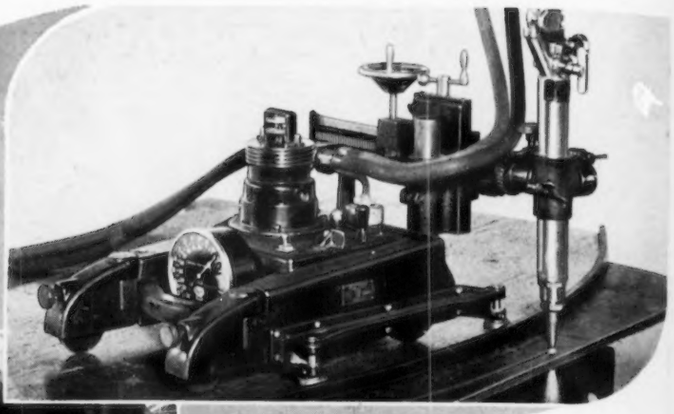
To Westinghouse we extend the hand of greeting on the occasion of this anniversary year. Industries served by these two of the "coöperative specialists" may, by this token, count on continued satisfactory service.

Ingersoll-Rand
11 Broadway, New York City

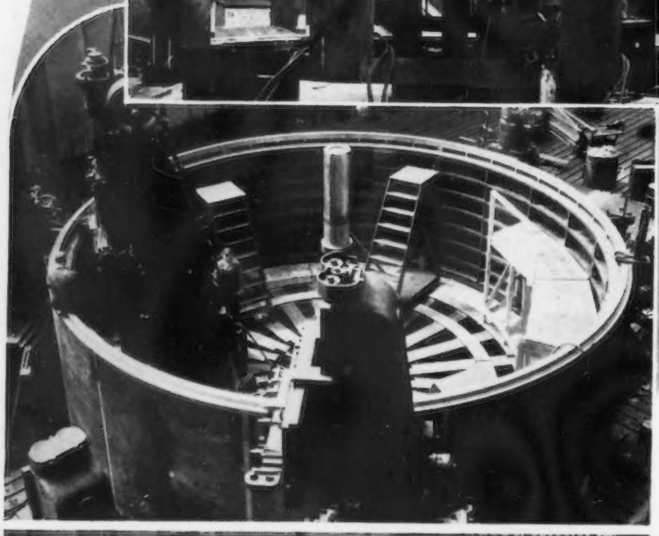
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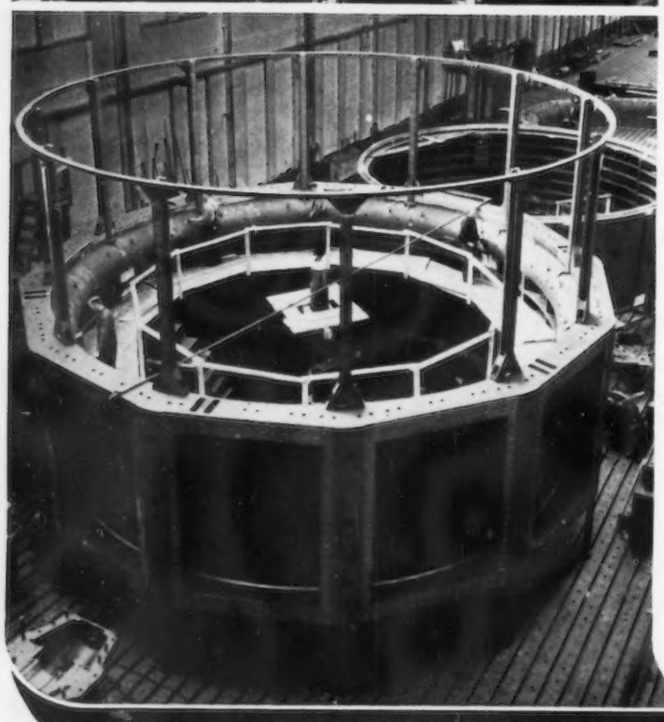


This Ingersoll-Rand XPV-3 Compressor supplies air for the Westinghouse Foundry at Trafford City, Pa.









Smooth, Uniform Cuts

with the Airco-DB Radiagraph

The photographs show various views of the world's largest gate valves constructed by Westinghouse for Boulder Dam. These valves, 32 feet in diameter controlling two million horsepower, were cut by the oxyacetylene flame, using Airco-DB Gas Cutting Machines, one of which is shown above.

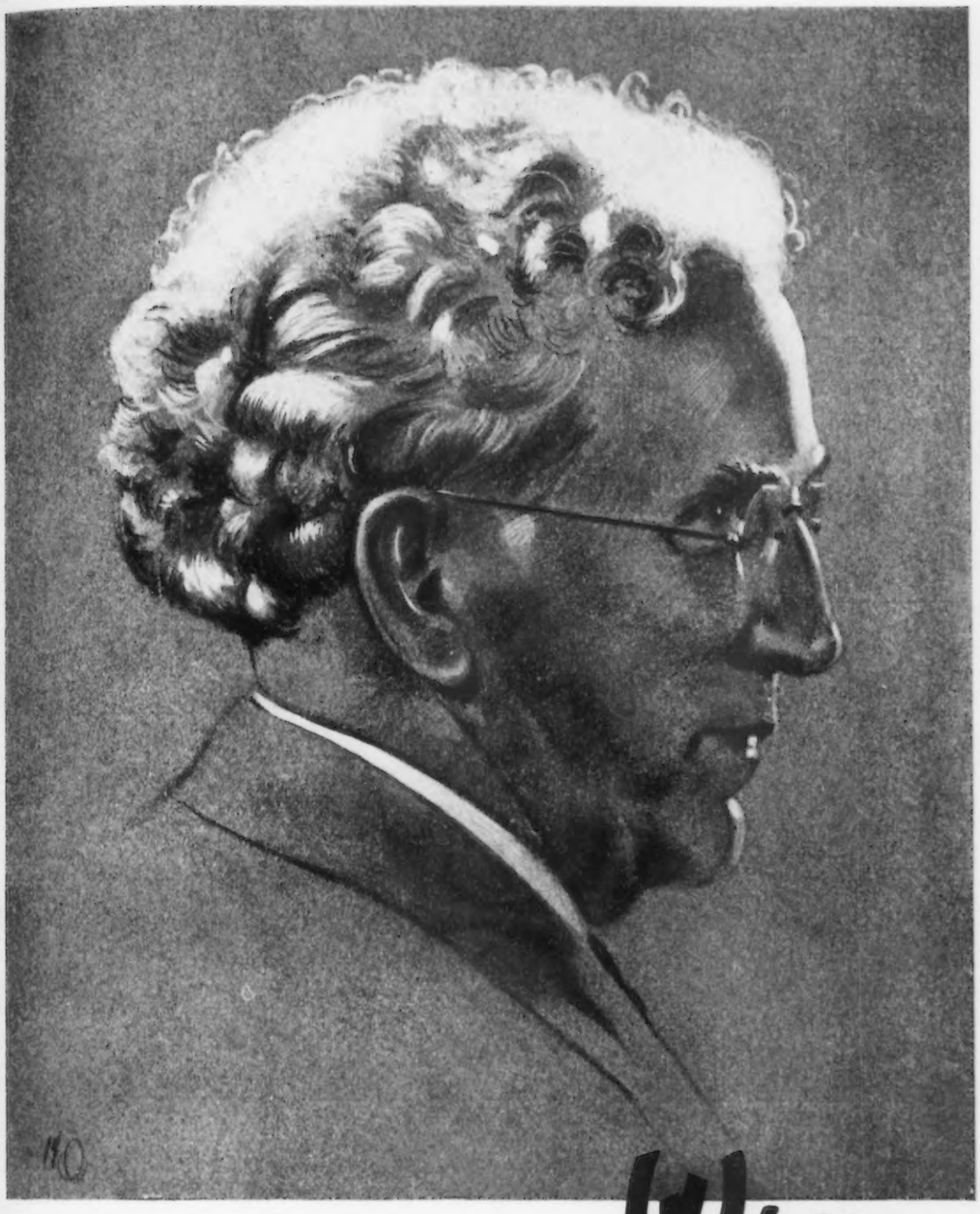
These cutting machines in combination with Airco Oxygen and Acetylene make possible smooth, uniform cuts with clean, sharp edges at lower cost and in less time than by previous methods of fabrication. A request to our home office will bring to you booklets showing the possibilities of this process as applied to your industry.

AIR REDUCTION
SALES COMPANY

General Offices: 60 E. 42nd St., N. Y. C.

DISTRICT OFFICES and DISTRIBUTING POINTS in PRINCIPAL CITIES

PIONEERS IN DEVELOPING OXYACETYLENE CUTTING PRACTICE AND MACHINES



We have been serving Westinghouse Electric & Mfg. Co. since the formation of our Company and extend our heartiest congratulations on their Golden anniversary.

Whitey Sez:

Arc Welding under present day production, calling for quick delivery of product plus quality workmanship, demands the time-proven dependability of Maurath Processed

Arc-Welding Electrodes

Maurath, Inc., oldest company producing Alloy Electrodes exclusively, can furnish any analysis to meet your specifications. Send for data book.

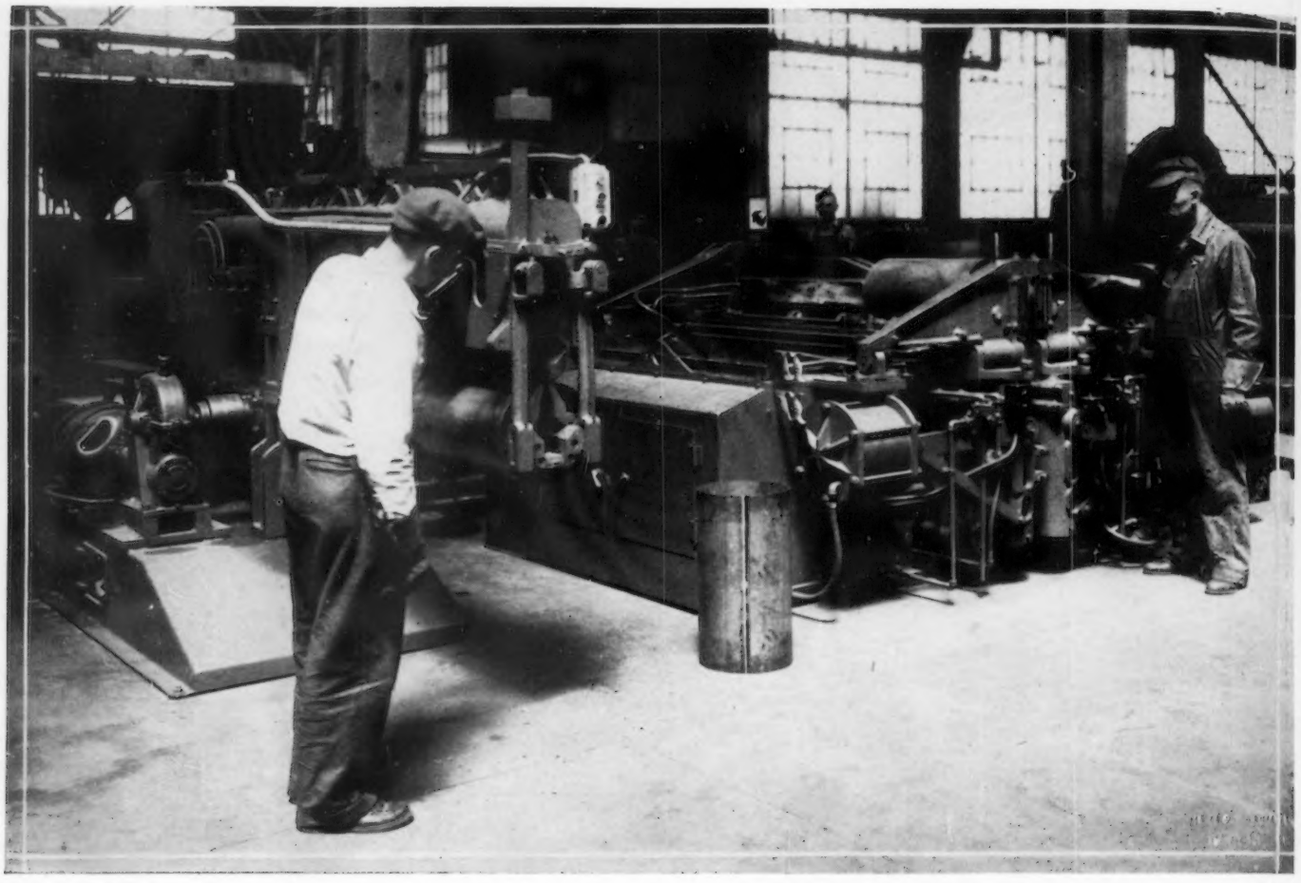
"We maintain the most complete and efficient Welding Rod Plant in the country."

"Come up and see us sometime!"

MAURATH, INC. CLEVELAND MAURATH ELECTRODES IN WORLD WIDE USE **OHIO**

WESTINGHOUSE

uses Federal RESISTANCE WELDERS



Transformer tanks at the Sharon plant of Westinghouse Electric & Manufacturing Company are seam welded on a Federal 60″ Resistance Flash Welder. These tanks vary in size from 15″ long x .050″ thick to 55″ long x 1/8″ thick.

The welding cycle takes 9 seconds on 14 gage tanks 54″ long. On light gage tanks the production is 200 to 250 per hour.

The Federal 60″ Flash Welder is of latest design, fabricated steel bedplate, equipped with two 300 KVA welding transformers and a Federal 60″ Flash Trimmer. A patented Federal feature provides parallel clamping through toggle levers connected to front and rear of machine and actuated by air cylinders.

We extend our congratulations to Westinghouse on their 50th Anniversary for the great progress they have made in the manufacture of dependable electrical apparatus.

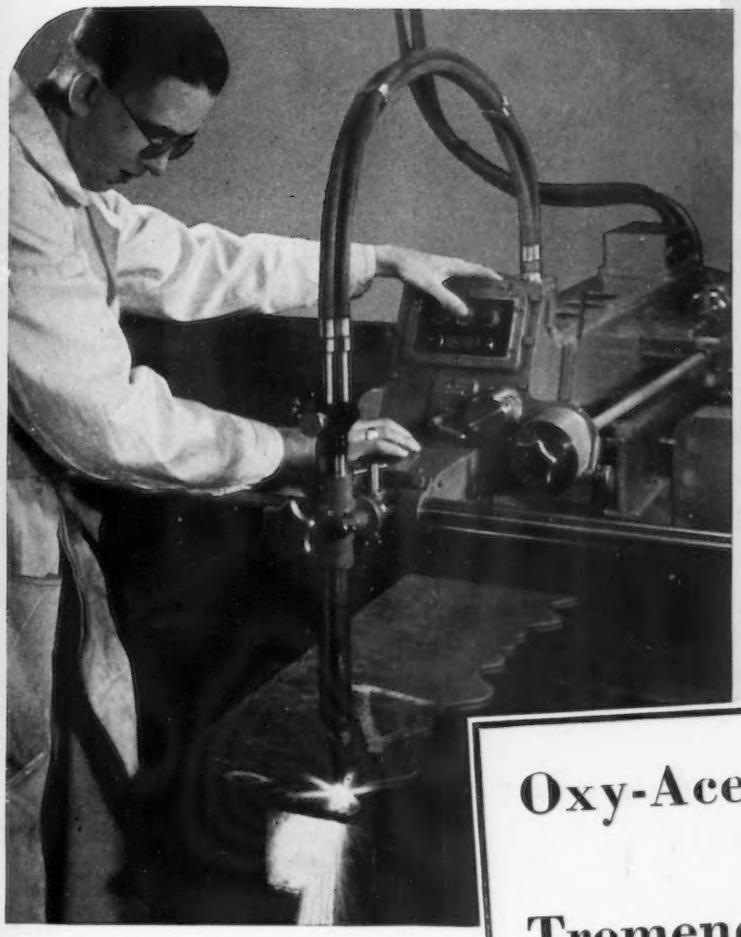
The Federal Machine & Welder Co.

ELECTRIC WELDERS OF ALL TYPES

Factory and Home Offices: Warren, Ohio

Sales Offices:

BUFFALO—2006 Rand Bldg.
CHICAGO—9 S. Clinton St.
CINCINNATI—626 Broadway
CLEVELAND—2036 E. 22nd St.
DETROIT—2832 E. Grand Blvd.
LOS ANGELES—Smith Booth Usher Co., 2001 Santa Fe Ave.
SAN FRANCISCO—Moore Machinery Co., 550 Fifth St.
PHILADELPHIA—Bourse Bldg.
PITTSBURGH—Leonard R. Nourie, Park Bldg.
NEW YORK CITY—Room 569, 50 Church St.
ST. LOUIS—Halpin Company
TULSA—Brammer Machine & Tool Service Co., Box 1017.
WORCESTER, MASS.—Taylor-Hall Welding Corp.





Diesel marine-engine connecting rod 9 ft. 3 in. long and 16 in. thick cut to shape by the oxy-acetylene process.



Precision cutting to close tolerances becomes possible through the use of precision built machines.

Oxy-Acetylene Cutting *effects* Tremendous Economies in Shaping Steel

BECAUSE of the new and improved machines developed by Linde, automatic applications of oxy-acetylene cutting are finding increasing opportunities to lower manufacturing costs. Shapes are cut from steel with such speed and precision that, in many plants, designs as well as manufacturing methods have undergone vast changes.

Of the new machines, the Type CM-12 Oxweld Shape Cutting Machine, illustrated, is the most ideally adapted to general use by the heavy industries. The CM-12 reflects the years of experience, engineering and scientific research in oxy-acetylene cutting accumulated by Units of Union Carbide and Carbon Corporation. It includes a number of unusual features never before provided and permits the widest variety of special cutting operations to be performed.

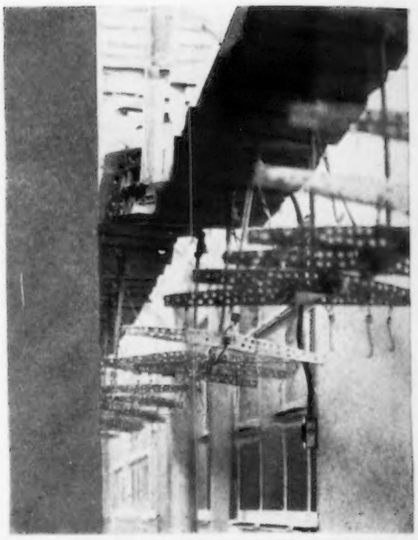
Let Linde Help You

A Linde representative will be glad to give you complete information about the new CM-12 and to help you adapt oxy-acetylene cutting to your specific steel-shaping requirements. Linde offices are located in principal cities throughout the country. Address the Linde office in your city or The Linde Air Products Company, Unit of Union Carbide and Carbon Corporation, 30 East 42nd Street, New York, N. Y.

Everything for Oxy-Acetylene Welding and Cutting

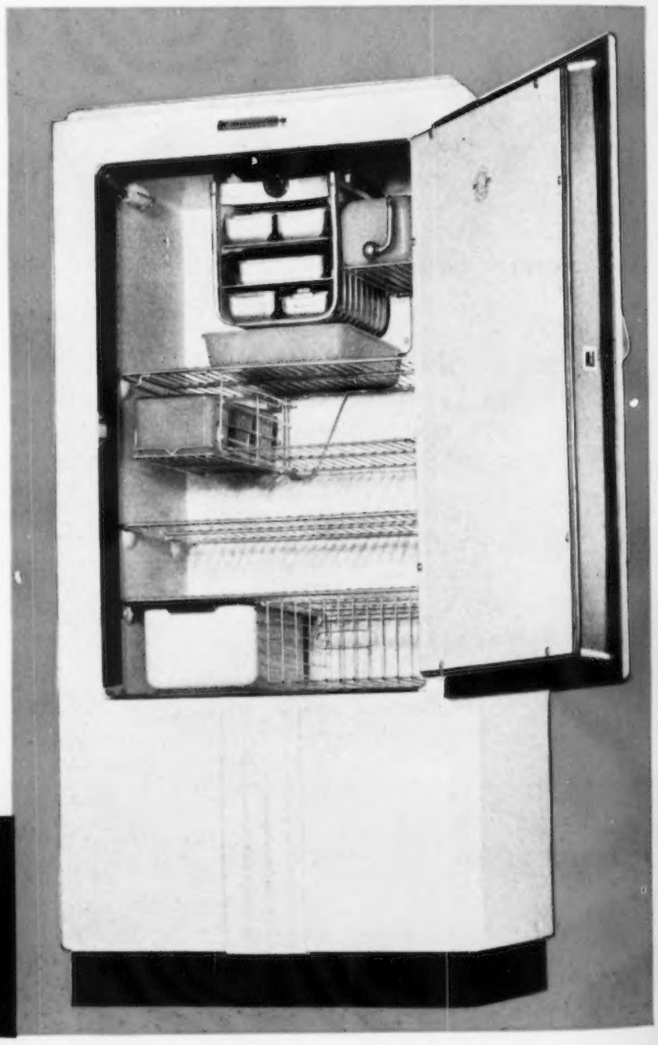
LINDE OXYGEN • PREST-O-LITE ACETYLENE • OXWELD APPARATUS AND SUPPLIES FROM UCC (PRODUCTS OF UNITS OF UNION CARBIDE AND CARBON CORPORATION) LINDE UNION CARBIDE

Westinghouse *by* Inland Enameling



ALL through its fifty years of achievement, The Westinghouse Electric & Manufacturing Co. have enjoyed an outstanding reputation for quality products. . . . And the basis for this high quality has been the scientific selection of all materials.

We are, therefore, particularly pleased that Inland Products have contributed toward this success. Westinghouse uses Inland Enameling Iron for the panels and wrapper sheets of its famous refrigerator, and for the enameled parts of its electric stoves.

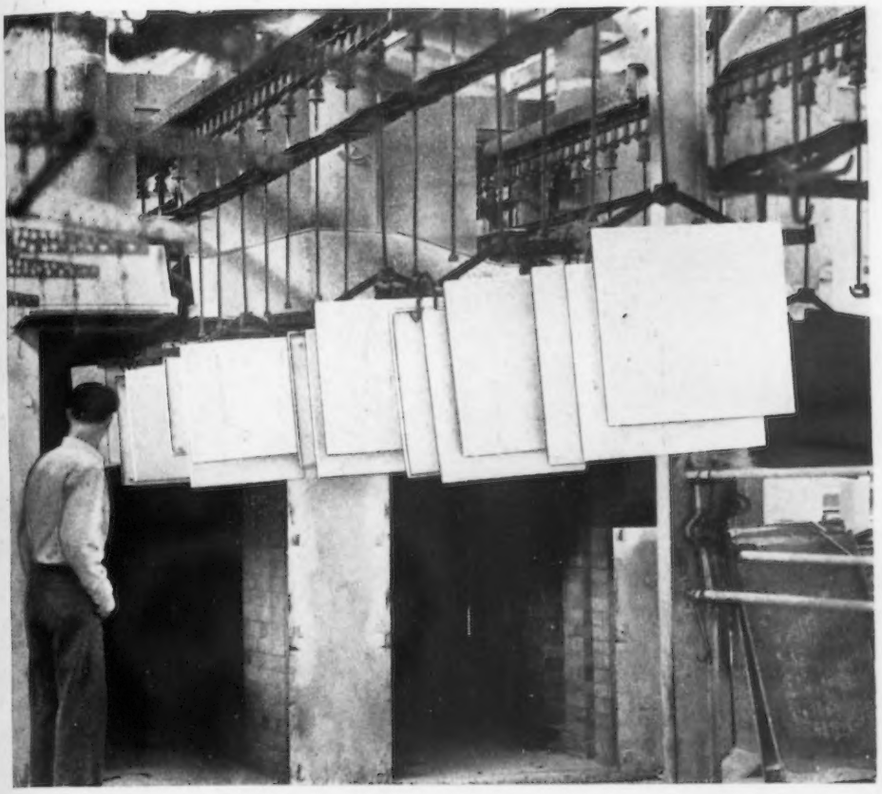


Westinghouse has found Inland Enameling Iron Sheets of uniform high quality, clean and free from impurities, easy to form, and ready to take a perfect vitreous enamel finish.

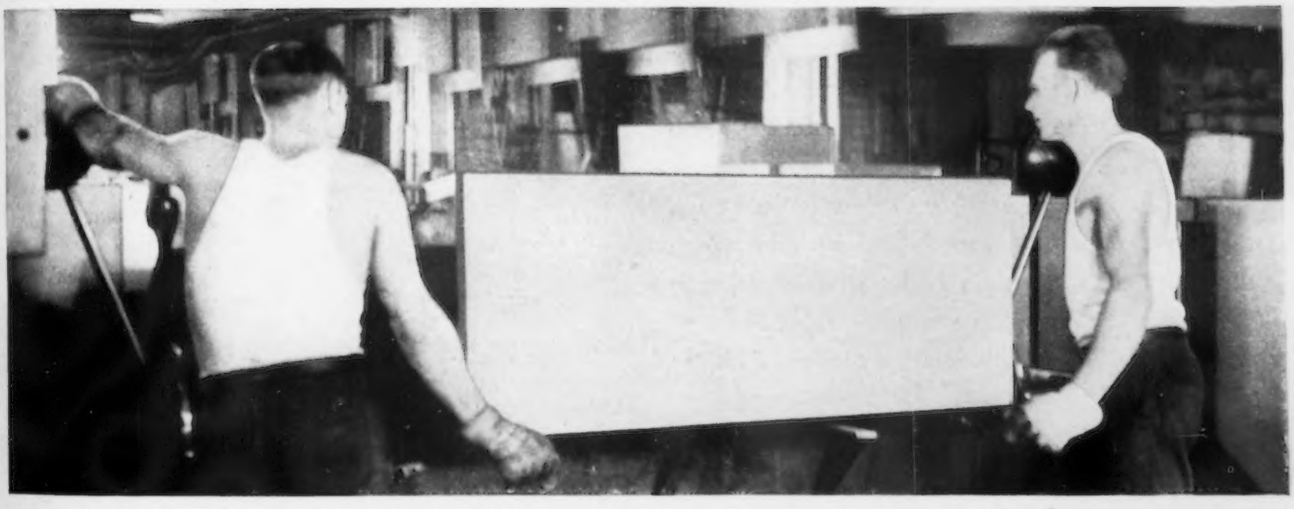
We are very happy to work with Westinghouse, and hope they may enjoy an even bigger and better party on the occasion of their Hundredth Anniversary.

INLAND STEEL

Quality Guarded Iron Sheets



Two views of Inland Sheets being used in manufacturing Westinghouse Refrigerators. *At left:* panels of Inland Vitreous Enameling Iron Sheets coming from the enameling furnace. *Below:* Inland wrapper Sheets being formed for the bodies of Westinghouse Refrigerators.



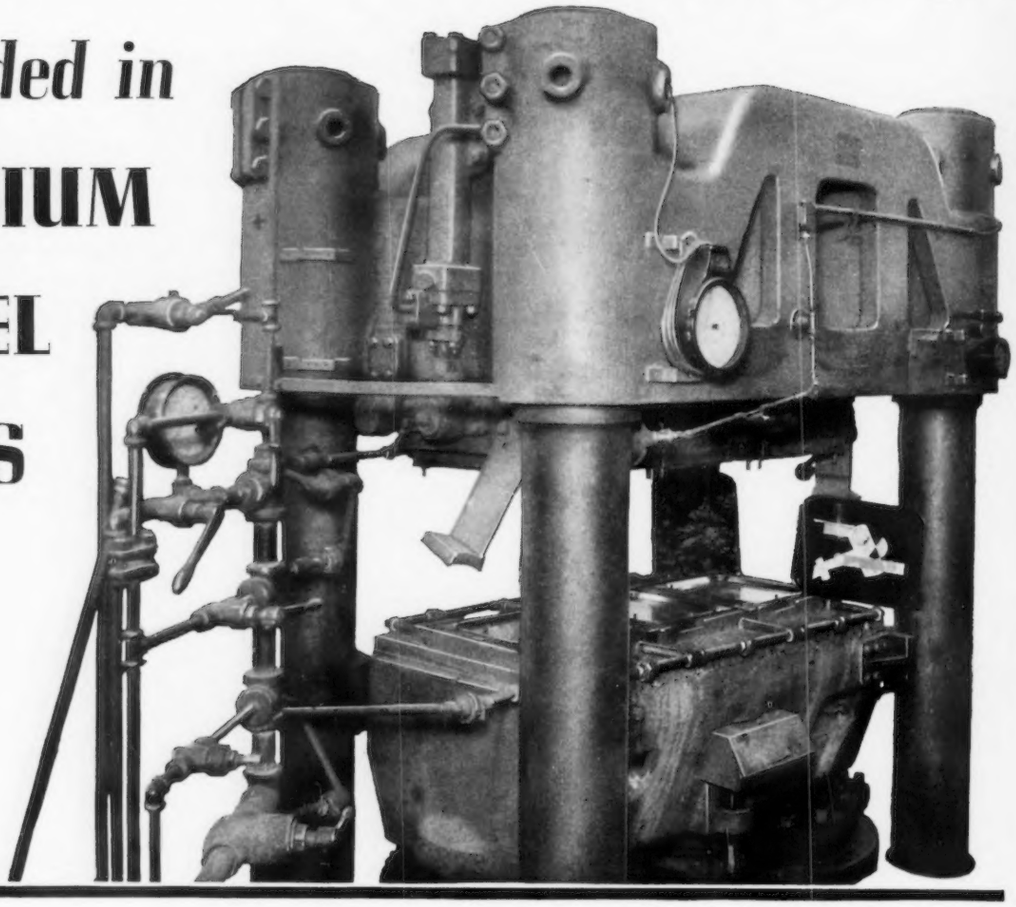
SHEETS • STRIP • TIN PLATE • BARS • PLATES • STRUCTURALS • PILING • RIVETS • BILLETS • RAILS • TRACK ACCESSORIES

INLAND STEEL CO.

General Offices: 38 South Dearborn Street, Chicago, Illinois

WESTINGHOUSE *Micarta Trays*

are Molded in VANADIUM STEEL DIES



For the dies that mold the well-known Micarta Trays, Westinghouse uses SAE 6150... a Chromium-Vanadium Steel with the high physical properties necessary to withstand the heavy pressure of the forming operation.

To attain perfect smoothness of the finished trays, the dies require a high machine finish after which they are chromium-plated. This high finish is made possible by the fine grain structure of 6150.

In countless other applications throughout industry where strength, toughness and durability are essential, you'll find Vanadium Steels. If you have a steel problem of this kind to solve, Vanadium Metallurgists will be glad to consult with you and make recommendations. No obligation, of course.

•

VANADIUM CORPORATION OF AMERICA
420 LEXINGTON AVENUE, NEW YORK, N. Y.

Plants at Bridgeville, Pa., and Niagara Falls, N. Y.
Research and Development Laboratories, Bridgeville, Pa.

Vanadium *Steels*

METALS VANCORAM ALLOYS

FERRO ALLOYS
of vanadium, silicon, chromium, and titanium, produced by the Vanadium Corporation of America, are used by steel makers in the production of high-quality steels.

FOR STRENGTH · TOUGHNESS · DURABILITY



WESTINGHOUSE 1886 W 1936 GOLDEN JUBILEE

MAKE EACH OTHER POSSIBLE

There are few products which are as closely associated and which so vitally depend upon each other as electricity and steel.

Were it not for steel, electricity could not be produced, controlled, distributed and applied as efficiently as it is today. No one knows this better than Westinghouse Electric & Manufacturing Company—one of the world's largest manufacturers of electrical equipment and appliances.

On the other hand, it can be said just as truthfully that were it not for electricity, the modern steels of today and the prices at which they are produced would not be possible. Republic Steel Corporation—the country's third largest producer of steel and the world's largest producer of fine alloy steels—fully appreciates how much steel making depends upon electricity.

Republic is proud of the fact that Republic steels have in various ways furthered the production and use of electricity and Republic is proud of the fact that its products are closely associated with those of Westinghouse—a concern well deserving of congratulations on its fiftieth anniversary of development and manufacture of products that promote civilization.

REPUBLIC STEEL

Republic Steel CORPORATION

GENERAL OFFICES · · · CLEVELAND, OHIO


WESTINGHOUSE
1886
1936
GOLDEN JUBILEE
EMPIRE

SURROUNDING the *Future Generation* WITH the BETTER THINGS in LIFE

For half a century Westinghouse has been one of the foremost in raising the standard of living of the world—striving earnestly and sincerely to place within reach of all, the things which but a few years ago were only available to the few.

That Westinghouse has accomplished this—an accomplishment without sacrifice of quality—is vouched for through the universal endorsement it enjoys in industry and in the home.

To say Westinghouse is fifty years old as it celebrates its Golden Jubilee—is a misnomer. To say Westinghouse has had fifty years of practical training is to credit a broad experience to the progress that is assured in the future—carrying with it as it does the faith of an appreciative and always increasing following. Today "Westinghouse" is on the lips of every discriminative buyer of quality merchandise.

Empire is proud of the part it has been permitted to take in the success of Westinghouse. Together they have worked for a number of years—each with a single thought in common — the maintenance of but one standard of quality—the highest obtainable.

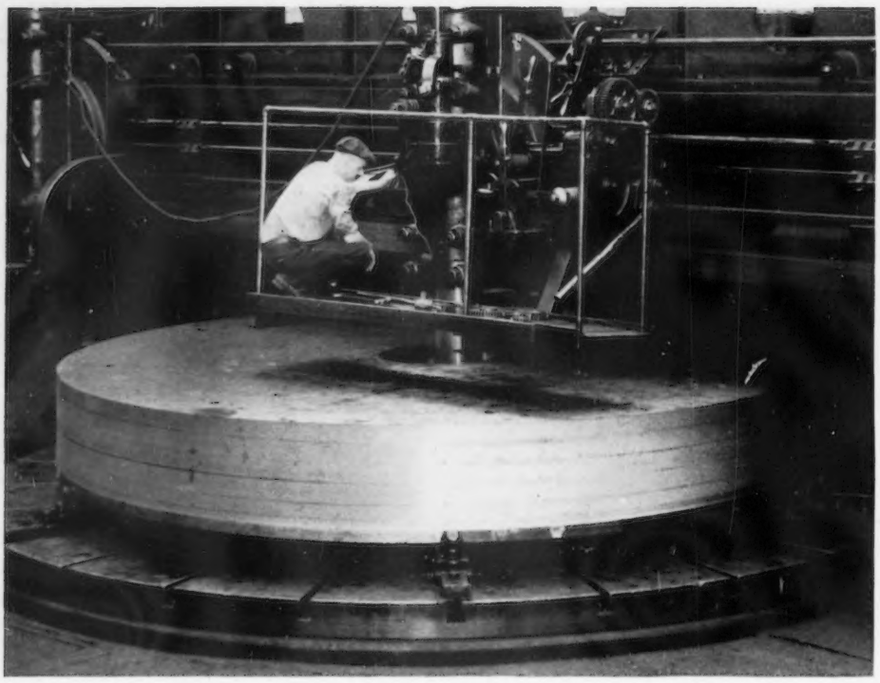
It is Empire's privilege to furnish Westinghouse with a generous share of its sheet steel requirements. This endorsement of quality and confidence is appreciated by Empire.

To safeguard this confidence so it may continue to deserve this same pleasant relationship with all of those it is privileged to serve is Empire's pledge as it congratulates Westinghouse during its Golden Jubilee.

EMPIRE SHEET & TIN PLATE COMPANY
MANSFIELD, OHIO

E SHEETS

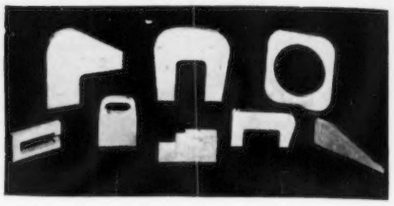




Building a flywheel in the Westinghouse plant from six circular flame-cut steel plates rolled by Lukens. Each plate was about 186" diameter, 4½" thick and weighed about 35,000 lbs.



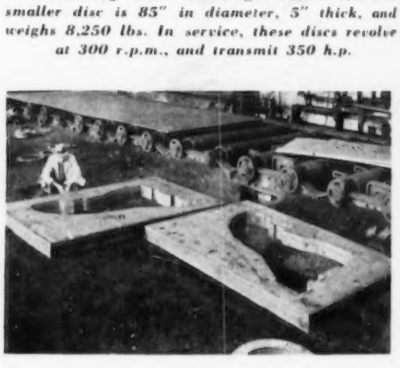
Expansion plates flame-cut by Lukens for use in highway work. They are made from 1½" thick steel plate, and are 49' 5½" long.



Group of small flame-cut steel plates, produced by Lukens, illustrating the variety of small parts that can be obtained economically by flame-cutting.



Chipper discs used in pulp-handling equipment, flame-cut by Lukens. The larger disc is 119" in diameter, 5½" thick and weighs 18,200 lbs. The smaller disc is 85" in diameter, 5" thick, and weighs 8,250 lbs. In service, these discs revolve at 300 r.p.m., and transmit 350 h.p.



Flame-cut steel plates produced by Lukens for use in automobile body production. They are 118" long, 78" wide, 7½" thick, and weigh 20,240 lbs. each.

WHEELS *in the* WORK *of* WESTINGHOUSE

As industry acclaims Westinghouse on the occasion of its Golden Jubilee, Lukens is proud to contribute to Westinghouse achievements through the use of Lukens products in Westinghouse equipment.

To Westinghouse, Lukens furnishes heavy, flame-cut steel plates for use in the construction of flywheels for Westinghouse equipment, for bases of Westinghouse motors and for parts of other Westinghouse products.

Many other machinery and equipment manufacturers likewise have found advantages and economies in the use of Lukens flame-cut plates in a wide variety of parts, large and small. Lukens flame-cut plates are also used for die shoes, reducer plates, punch plates, blank holder plates, bolster plates and riser plates, and for bases for machines, engines and other heavy equipment.

If you are not familiar with the advantages and economies of Lukens flame-cut steel plates for parts of machinery and equipment, write today for information. Better still, send your parts prints for quotations.

LUKENS STEEL COMPANY

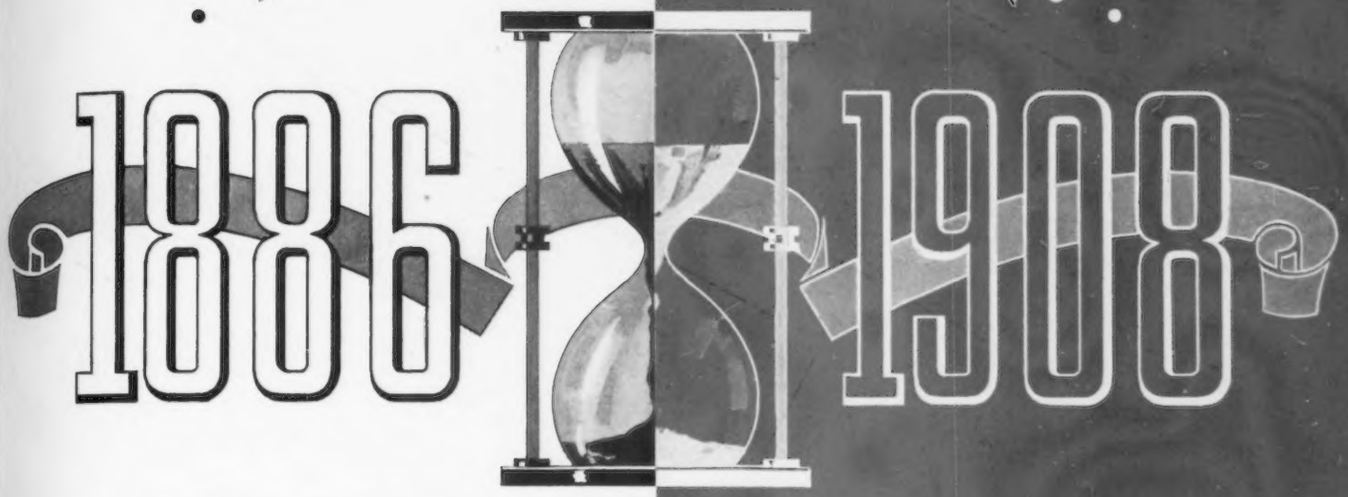
FIRST TO ROLL BOILER PLATE IN AMERICA

COATESVILLE, PENNSYLVANIA

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Baltimore Boston Chicago Cincinnati Cleveland Detroit El Paso Houston Los Angeles Montreal New York Philadelphia Pittsburgh San Francisco Seattle Syracuse Toronto

TWO SIGNIFICANT YEARS



1886 IS A LONG TIME AGO

...but it marks the beginning of a golden era of achievement by the WESTINGHOUSE ELECTRIC AND MANUFACTURING COMPANY. The past half century has witnessed far-reaching change and improvement in the living and working conditions of countless millions. Largely responsible for this vast change has been the ability to make widely available man's greatest modern servant: ELECTRICAL ENERGY. Factory, farm and household have benefited through the engineering genius of the WESTINGHOUSE Organization which has pioneered, developed and adapted electrical products and equipment and thus contributed to the advancement of civilization.

The WESTINGHOUSE Golden Jubilee celebrates not only 50 years in the building up of a truly great American institution, but represents as well 50 years of devotion to an ideal: TO BETTER SERVE MANKIND.

WESTINGHOUSE 1886 1936 GOLDEN JUBILEE

1908 IS ALSO A LONG TIME AGO

. . . and during that span of 27 years THE RIVERSIDE METAL COMPANY has been privileged to supply continuously Phosphor Bronze and other non-ferrous alloys to the WESTINGHOUSE ELECTRIC AND MANUFACTURING COMPANY.

We acknowledge with sincere appreciation this concrete evidence of faith in our business methods and the quality of our products, proving as it does that though time may swiftly pass and methods and customs change, the dependability of RIVERSIDE Phosphor Bronze and other non-ferrous alloys is as true today as when in 1908 WESTINGHOUSE favored this Company with their first order.

RIVERSIDE
PHOSPHOR BRONZE
•
NICKEL SILVER
•
BERYLLIUM COPPER
SHEET — STRIP
WIRE — RODS

THE RIVERSIDE METAL COMPANY
RIVERSIDE *Burlington County* **NEW JERSEY**
NEW YORK • HARTFORD • CLEVELAND • CHICAGO

"GOLDEN JUBILEE" IS FITTING

Westinghouse

for your achievements gleam as fine gold



Fifty years is a long time in which to render distinguished service to mankind. Your achievements gleam as fine gold, Westinghouse: and Armco is proud of its long association with you. During thirty-three of your fifty bright and shining years, we have worked shoulder to shoulder in the perfection of electrical sheet steel. These have been absorbing years, happy years.

Electricity today is the very essence of life. Its wonders never cease. Its miracles of light, power and communication have helped as much as anything else to make many diverse races and nations as one.

Name any industry, and you immediately vision whirring wheels powered by electricity. Generators, dynamos, transformers and motors are to the world's

THE AMERICAN ROLLING MILL COMPANY ★ EXE



industrial system what the heart and other vital organs are to the human system —indispensable, vital. And our home life . . . would it be so attractive without scientific illumination, without the mechanical servants that keep it clean, that preserve and cook its food, that fill the nights with music, and perform countless other tasks right to the appointed minute?

No greater service could be performed than to make this world a more comfortable, convenient and pleasant place in which to live. But tomorrow beckons, and many tomorrows beyond. Yours is a service not measured by time, Westinghouse. It is measured by lasting contributions to the work of the world.

The American Rolling Mill Company. Executive Offices: Middletown, Ohio.

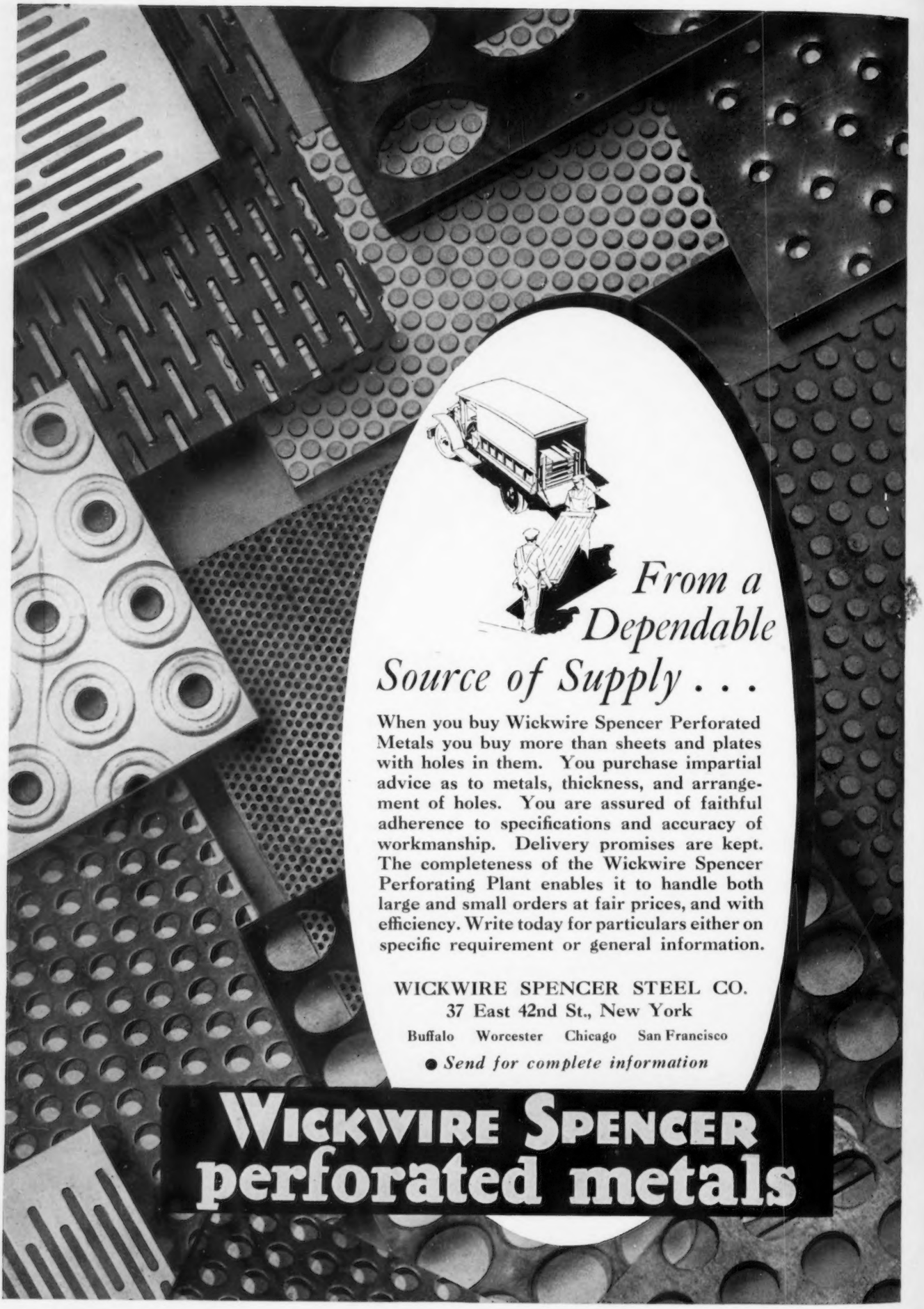
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W 1886 W 1936

S

ARMCO

EXE OFFICES ★ MIDDLETOWN ★ OHIO


From a
Dependable
Source of Supply . . .
When you buy Wickwire Spencer Perforated Metals you buy more than sheets and plates with holes in them. You purchase impartial advice as to metals, thickness, and arrangement of holes. You are assured of faithful adherence to specifications and accuracy of workmanship. Delivery promises are kept. The completeness of the Wickwire Spencer Perforating Plant enables it to handle both large and small orders at fair prices, and with efficiency. Write today for particulars either on specific requirement or general information.
WICKWIRE SPENCER STEEL CO.
37 East 42nd St., New York
Buffalo Worcester Chicago San Francisco
● Send for complete information
WICKWIRE SPENCER
perforated metals

Soled on Safety



CENTRAL
Quality
PRODUCTS

Forging Billets Slabs

Sheared and Universal Plates

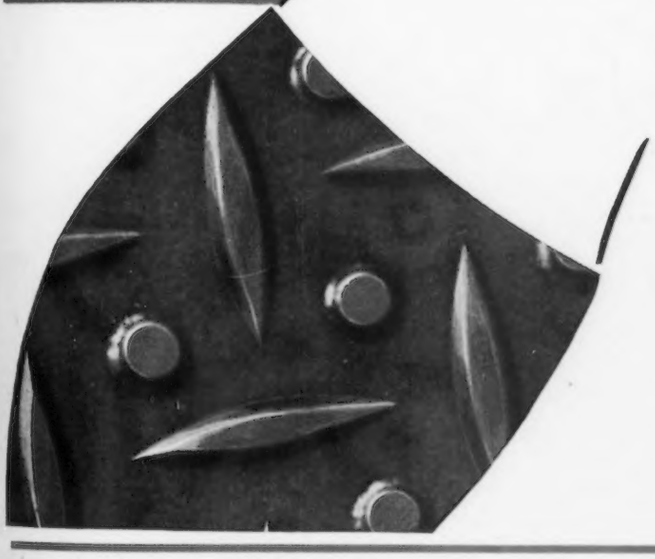
"CENTRALLOY"
High Tensile Steel

Blue Annealed Sheets

Flanged and Dished Heads

Steel Stampings

Rolled Steel Floor Plates
"Knobby" "All-way-grip"



As though fitted to the very sole and heel of the worker's shoe—Central's "ALL-WAY-GRIP" pattern adds a decided improvement to rolled steel floor plate. *Geared* to a positive security in foot traction, your employees are actually *soled on safety* . . . and you—*sold on its merits.*

Thorough study of design and its application to unity in composition has resulted in this "ALL-WAY-GRIP" pattern of distinctive balance. Aside from its perfect symmetry, this *all-directional* plate provides a maximum economy and minimum wastage in shearing . . . each diamond projection centering the next one at right angles.

A helpful folder listing and illustrating in full scale Central's non-skid floor plates in two leading patterns will be mailed you without obligation.

CENTRAL IRON & STEEL CO. . HARRISBURG, PENNA.

For ELECTRICAL PARTS...



REVERE FORGINGS OFFER 6 ADVANTAGES:

Twice wrought metal
Denser metal
Less weight
Better finish
Better and more uniform conductivity
Less machining time

You can get the same good results as *other* manufacturers who have changed to Revere Forgings from sand castings. Revere's Technical Advisory Service will be glad to give you every assistance in solving the technical problems involved. Prove to your own satisfaction that Revere Forgings lower costs and *improve* the product. Write for more complete details.

Revere Copper *and* Brass

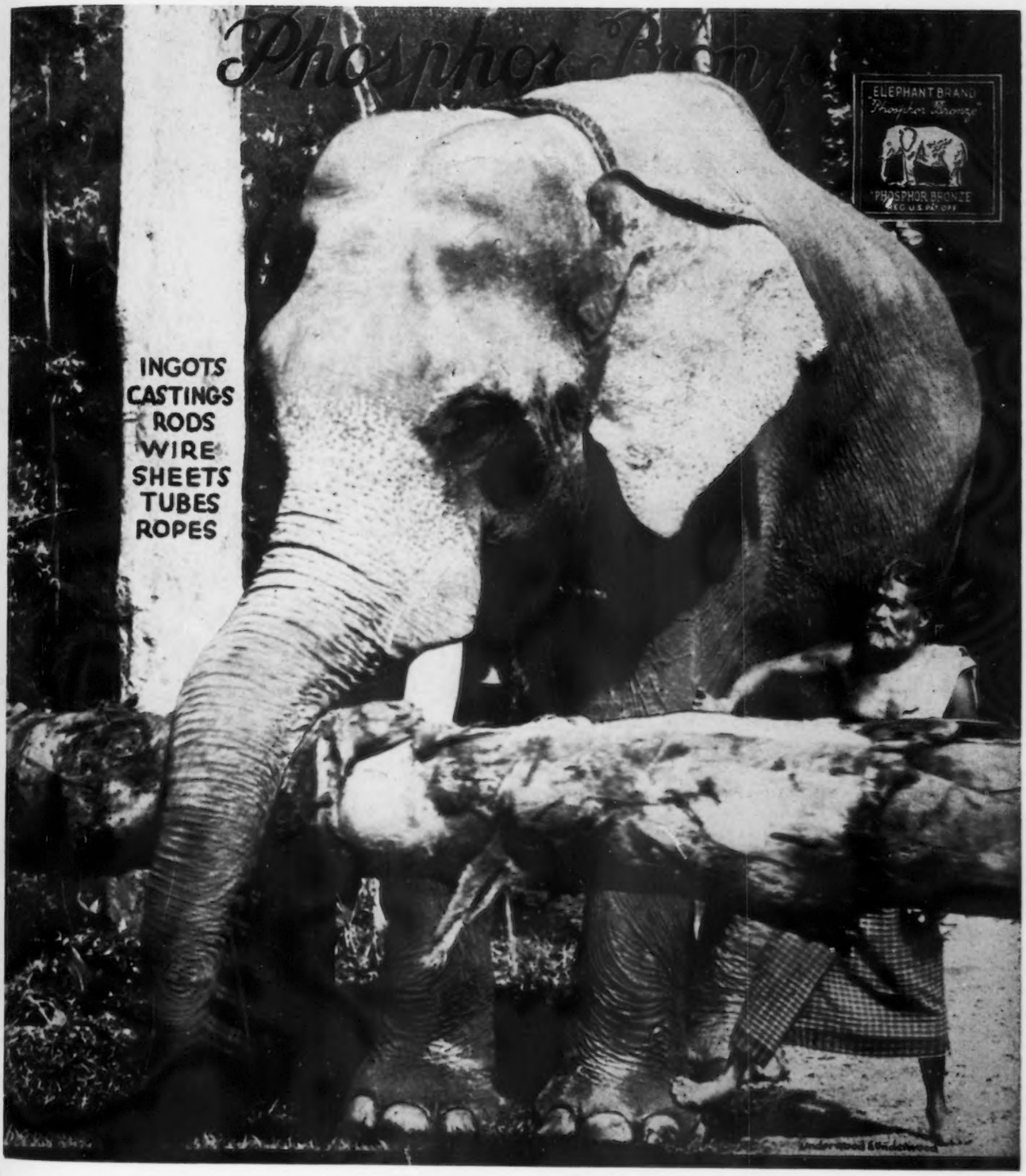
FOUNDED BY PAUL REVERE 1801

INCORPORATED

EXECUTIVE OFFICES: 230 PARK AVENUE, NEW YORK CITY · MILLS: BALTIMORE, MD. · TAUNTON, MASS.
NEW BEDFORD, MASS. · ROME, N. Y. · DETROIT, MICH. · CHICAGO, ILL. · SALES OFFICES IN PRINCIPAL CITIES

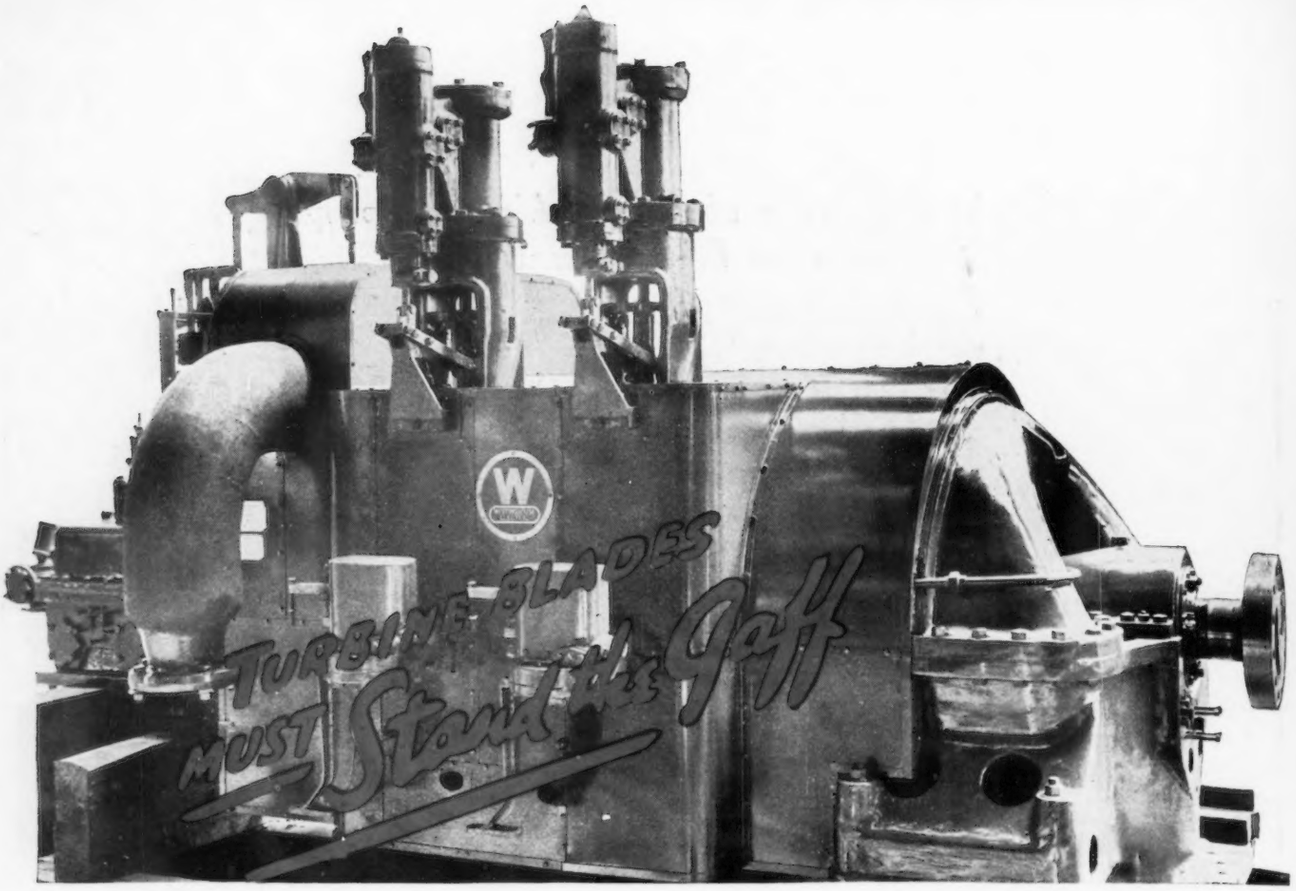
We and Elephants Never Forget

Congratulations and best wishes to the
Westinghouse Electric & Mfg. Company
on their Fiftieth Anniversary



The Phosphor Bronze Smelting Company

PHILADELPHIA, PENNA.



that's why WESTINGHOUSE uses RUSTLESS

WESTINGHOUSE writes stiff specifications. Their reputation for quality and performance has not been achieved through accident. Materials, workmanship and high ideals have played their part.

The fact that a goodly share of the turbine blade stock used by Westinghouse is RUSTLESS is ample endorsement of its quality and uniformity.

RUSTLESS stainless is made in a plant devoted exclusively to the manufacture of these alloys and our metallurgical and sales staffs are especially trained in their application. Their services are at your disposal.



In addition to Rustless Turbine Quality used by Westinghouse for blade stock, RUSTLESS alloys are furnished in all standard grades and in special analyses to meet special conditions of service. Available in forging billets, bars, rods and wire, in all commercial finishes. Complete engineering data on request.

RUSTLESS

IRON AND STEEL CORPORATION

BALTIMORE, MARYLAND

ARE YOU THE ONE MAN IN YOUR COMPANY...

Most Interested in Finishes and Finishing?

Then don't miss this opportunity!



Soon to be issued, the first group of PRODUCT SUMMARIES comprehensively describing ROXALIN Flexible FINISHES! Each deals with an individual ROXALIN FINISH, engineered for specific performance. Visual examples, in many cases, will accompany these Summaries. To make this important finish-information easy to work with, a properly tabbed file-pocket is provided. See Cut!

If you are the one man in your Company most interested in finishes and finishing . . . then don't miss this opportunity to have these ready-reference Blue Knight Product Summaries at your finger-tips. To get the first group of Blue Knight Product Summaries (FLEXIBLE LACQUER ENAMELS—Cellulose-type, Air-Dry), write on your company letterhead, mentioning the type of finishing in which you are most interested.

Address your Request to

ROXALIN FLEXIBLE LACQUER CO., Inc.

800-2 Magnolia Ave., Elizabeth, N. J.

ROXALIN *Flexible* FINISHES



CELLULOSE & SYNTHETIC TYPES
ENGINEERED FOR SPECIFIC PERFORMANCE

Flexible Blue Knight FINISHES

LACQUERS-ENAMELS
M.&W.Co
1876

W
Westinghouse

31 Years Ago

• • • • • • in 1905, Maas and Waldstein received its first order from Westinghouse Electric; and, in 1909, it began serving Westinghouse Lamp, and Bryant Electric in 1911. During the years since that first order Maas and Waldstein has kept pace with the varied and exacting demands of this rapidly expanding industry . . . it is constantly developing lacquers, lacquer-enamels, and synthetic enamels to meet special production requirements.

M & W FINISHES For Electrical Equipment

- **Synpex Enamels**—the quick-drying properties of lacquers and the building qualities of synthetic enamels.
- **Metalustre Enamels**—a lustrous, durable metallic finish that covers in one coat.
- **Durad Enamels**—beautiful, durable, flexible, resistant to marring, humidity, grease, fruits, and household chemicals. They are suited to high, medium, or low heat, or air drying.
- **Clear Lacquers**—beautify and protect brass, copper, bronze, iron, steel, cadmium, nickel, chromium, silver, aluminum, and zinc.
- **Lacquer Enamels**—for zinc and aluminum die castings and general industrial uses.
- **Super Jet Black Lacquer Enamels**—gloss, flat, or rubber finishes that cover in one coat.
- **Chrome Rack Enamel**—protects racks from chrome plating solutions.
- **Spray Booth Compound**—applied to the interior of the booth reduces cleaning costs and protects the work from dust.

M & W technical representatives know the electrical industry's finishing requirements. They are prepared to supply complete finishing schedules for everything from sockets to air-conditioning units—wall plates, fans, water coolers, radiator enclosures, refrigerators, oil heating equipment—and the many other items that call for fine, durable finishes. An M & W technical representative will be glad to consult with you on your finishing problems.

MAAS AND WALDSTEIN COMPANY
438 Riverside Avenue Newark, New Jersey
Branch Offices and Warehouses:
1336 Washington Boulevard Chicago, Ill.
1228 W. Pico Boulevard Los Angeles, Cal.
Producers of LACQUERS & LACQUER ENAMELS for all PURPOSES

Westinghouse Insists

on Highest Quality Chromium Plating



TO WESTINGHOUSE, as to the other companies in 188 cities in the United States and Canada who are licensed under the U. C. chromium plating patents, United Chromium extends its experience and engineering cooperation... making available through its Licensing Arrangement dependable chromium plating procedure at low cost on thousands of varied products.

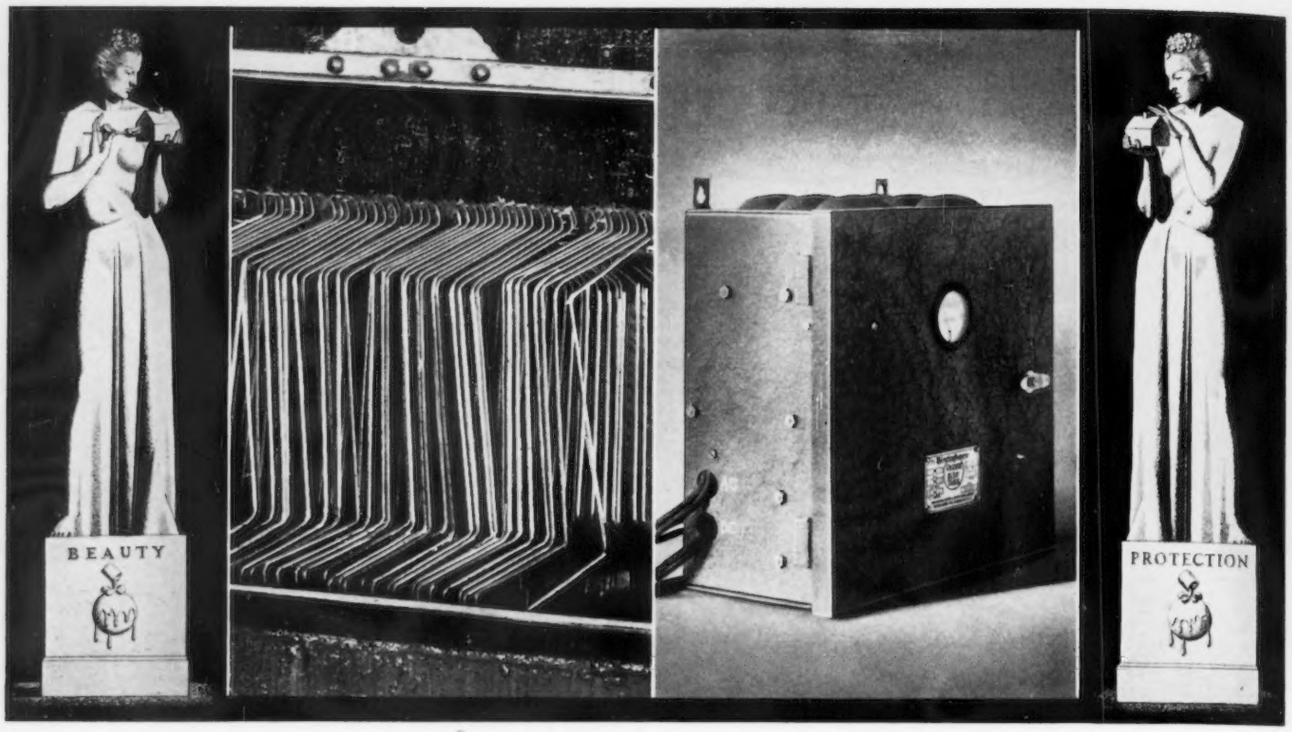
We would be glad to receive your inquiry about this licensing arrangement... and to advise you regarding the many proved opportunities to improve the appearance and durability of metal products and machinery through the use of properly applied chromium plating.

United Chromium
INCORPORATED

Executive Offices: 51 East 42nd Street, New York City · Detroit · San Francisco · Waterbury



SERVING A MAJOR INDUSTRY



WESTINGHOUSE WINDINGS ARE PROTECTED WITH AJAX VARNISH
WESTINGHOUSE CHARGERS ARE BEAUTIFIED WITH KEM FINISH

Coils are the heart of any electrical machine, and they must stand up under a wide variety of operating conditions. Westinghouse insures long life and dependable service with S-W AJAX INSULATING VARNISHES. For nearly 30 years Sherwin-Williams Research Laboratories have been at work developing and perfecting varnishes, enamels and compounds for every insulating requirement. S-W Ajax Varnishes provide maximum penetration of windings, thorough oilproofing, improved thermal characteristics, increased dielectric and mechanical strength. They stand up under severe operating conditions.

Engineered for duty, the Westinghouse Rectigon Battery Charger is given added beauty and protection with S-W KEM ART METAL FINISH.

S-W KEM ART METAL FINISH—

Needs no undercoater	Is extremely durable
Is quick handling	Yields a fine texture
Requires but ONE COAT	Comes in 15 smart colors
Toughens with baking	Is exceptionally beautiful

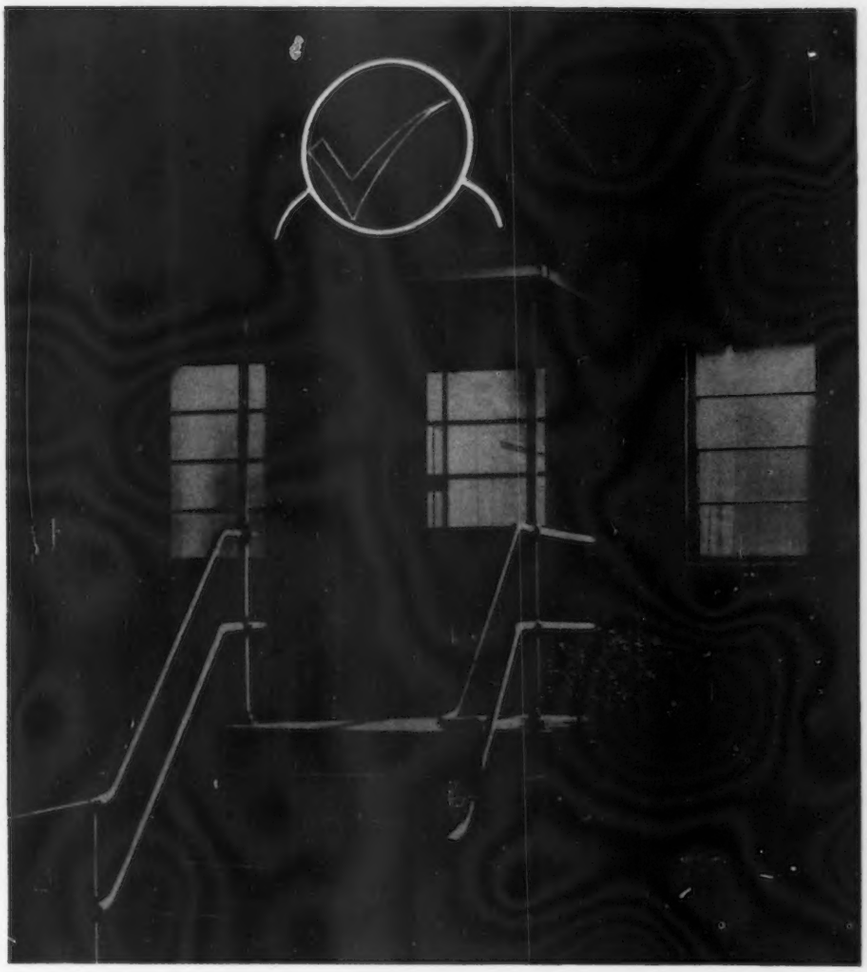
For all your finishing needs, remember Sherwin-Williams is Finishing Research and Engineering Headquarters. Write The Sherwin-Williams Co., Cleveland, Ohio, and principal cities.

WESTINGHOUSE 1886 W 1936 GOLDEN JUBILEE

SHERWIN-WILLIAMS

INDUSTRIAL FINISHES

SWP COVER THE EARTH



The Folks behind the Ferro Circle

congratulate the organization behind that other Circle on its Fifty Years of Service . . . .

MANY happy returns, Westinghouse! May your next half century be even more brilliant and more gratifying than your first. We're mere schoolboys ourselves, in a corporate manner of speaking, but our wish is that we may contribute a little something to 50 more years of Westinghouse progress . . . and that, when we reach our own golden anniversary, we may be able to look back on a record of service almost as indispensable in the porcelain enameling industry as yours has been in every phase of electrical advancement.

THE FERRO ENAMEL CORPORATION • CLEVELAND, OHIO

PORCELAIN FERRO ENAMELS



Westinghouse

Golden Jubilee REFRIGERATOR

The popularity of the Westinghouse refrigerator with the public is based on its many quality features. Nothing has been overlooked for convenience, economy of operation, and long life.

Among the long list of features that contribute to trouble-free performance is finish permanence. Under beautiful enamel, Bonderizing is used to prevent finish failure. Bonderizing prevents chipping and peeling . . . and consequent rust.

Westinghouse is one of the leaders in the adoption of scientific developments that assure greater value to the users of its products.

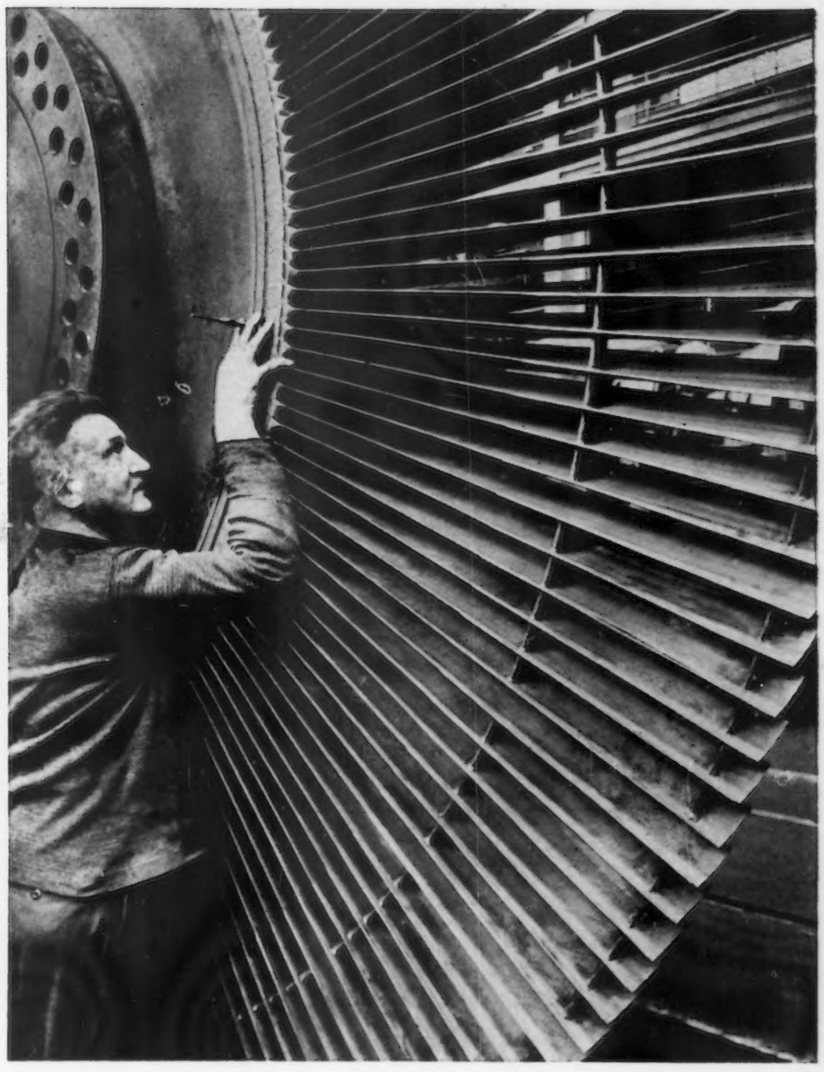
We congratulate Westinghouse on 50 years of achievement.

PARKER RUST-PROOF COMPANY • 2186 E. Milwaukee Ave. • DETROIT, MICH.



For more than 21 years, we have devoted our entire time and talent to the development of rust-proofing processes. Descriptive literature showing the wide variety of products to which these processes are applied is available to interested manufacturers and technical men. Send for it today.

PARKER
RUST-PROOFING
processes
BONDERIZING • PARKERIZING



Better . . . because it's *Stainless Steel*

THIS modern turbine rotor disc is *better because it's stainless steel!* The 38-inch blades are all forged from this strong, tough, corrosion-resistant metal . . . Stainless steel withstands the terrific radial stresses and vibration set up when the blade tip travels at more than a thousand feet a second, and resists the corrosion and erosion of millions of minute particles of steam and water impinging on it with lightning velocity . . . A better turbine is the result!

In thousands of other applications, stainless steel makes a better product and does a better job. If you want high strength, light weight, low maintenance, and long life in your equipment or product, you should investigate the many possibilities of stainless steel.

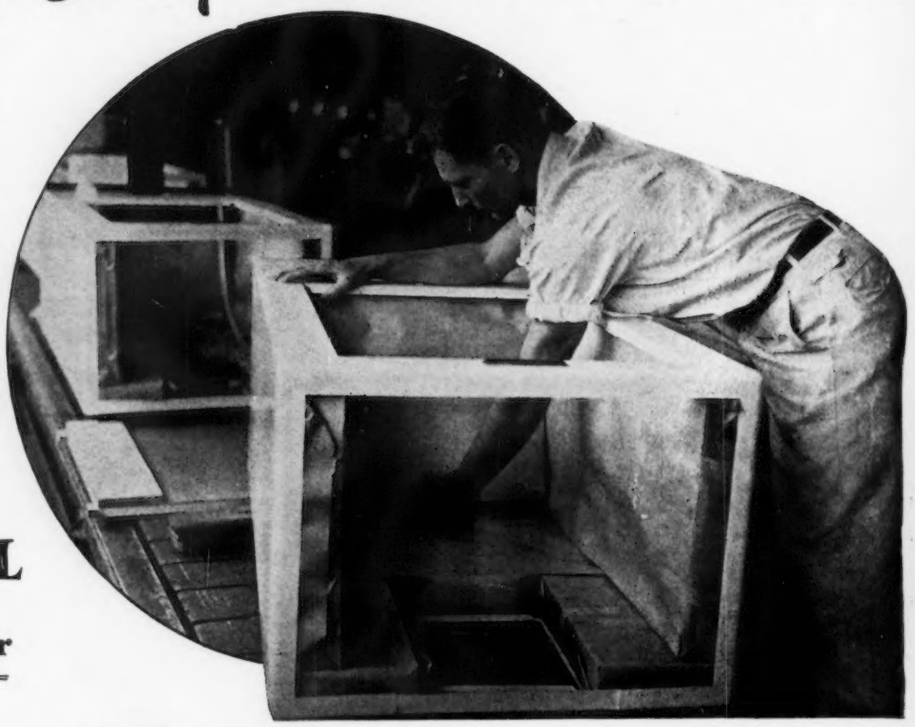
Electromet does not make alloy steels, but for over thirty years has supplied the ferro-alloys that go into their making. Thus much practical, unbiased information on alloy steels and irons has been developed, which is available to help you apply stainless steel to your equipment or product . . . The book "Stainless Steels And Their Uses" describes many interesting applications of this modern material already in use. Write for a copy today. There is no obligation.

ELECTRO METALLURGICAL COMPANY
Unit of Union Carbide and Carbon Corporation
UCC
CARBIDE & CARBON BUILDING **Electromet** Ferro-Alloys & Metals 30 EAST 42nd ST., NEW YORK, N. Y.

THE "Inside Story" OF A REFRIGERATOR

CROMWELL Pak-Pruf Paper was selected by Westinghouse engineers for packing insulation only after exhaustive tests had proved to their complete satisfaction that here was a strong, durable, water-repellent paper that would not shrink, stretch or swell—that provided positive protection against mold and moisture for the life of the refrigerator.

Pak-Pruf Paper is used the world over for packing and shipping—it's absolutely moisture-proof, dust-proof, rust-proof, tarnish-proof, scratch-proof, tasteless, odorless and non-abrasive. It comes in rolls, sheets or bags made to any specifications.



CROMWELL

Pak-Pruf Paper

QUALITY BUILT IN

Write today for Free Book containing complete information and swatches of 15 different weights and types of Pak-Pruf Paper.

The CROMWELL PAPER CO.

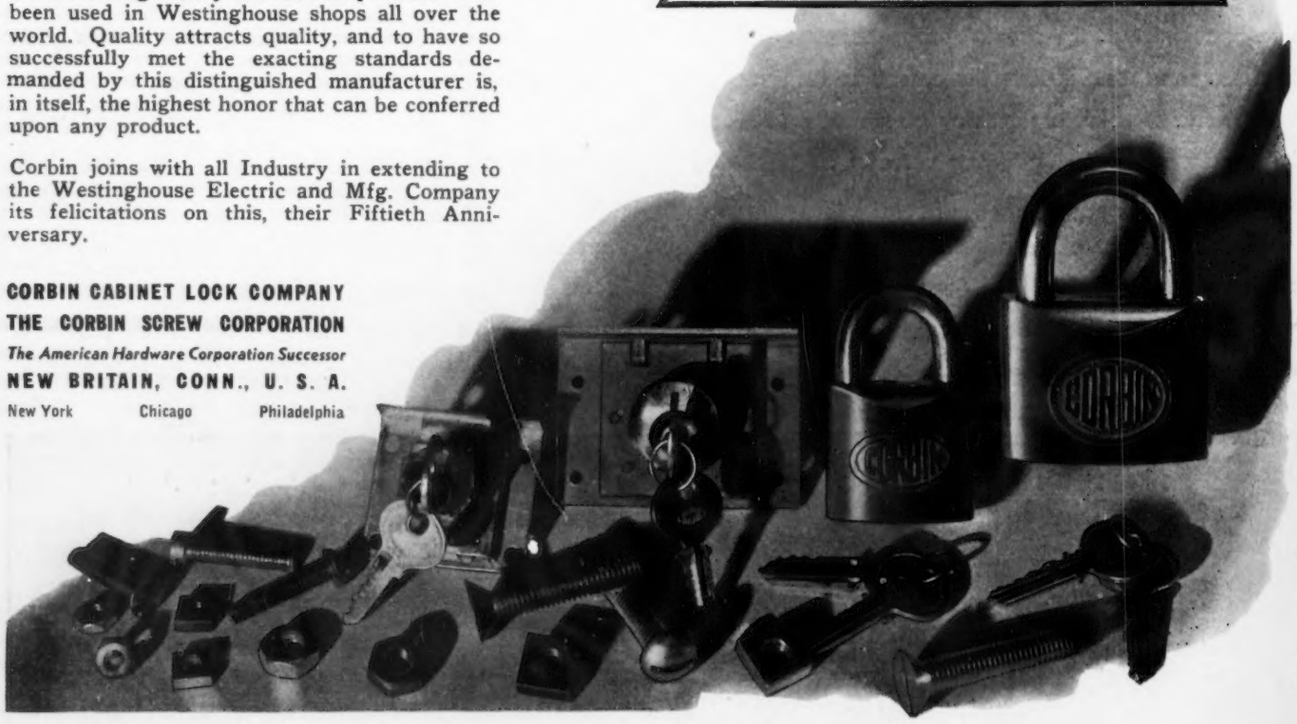
4801-29 S. WHIPPLE ST. CHICAGO

Westinghouse CORBIN *marches on*

Down through the years Corbin products have been used in Westinghouse shops all over the world. Quality attracts quality, and to have so successfully met the exacting standards demanded by this distinguished manufacturer is, in itself, the highest honor that can be conferred upon any product.

Corbin joins with all Industry in extending to the Westinghouse Electric and Mfg. Company its felicitations on this, their Fiftieth Anniversary.

CORBIN CABINET LOCK COMPANY
THE CORBIN SCREW CORPORATION
The American Hardware Corporation Successor
NEW BRITAIN, CONN., U. S. A.
New York Chicago Philadelphia



TAMCO CONTRIBUTES *two-fold* TO WESTINGHOUSE QUALITY



Congratulations to the Westinghouse organization for its 50 years of achievement. TAMCO is happy to be associated with this great American institution!

Into the glistening porcelain enamel which covers many a Westinghouse appliance, as well as into many of the sturdy metal parts that reside hidden beneath, go TAM *quality-improving* materials: TAM ceramic compounds for smoother, more enduring enamels . . . TAM metallurgical alloys for more effective metals.

Noteworthy among TAM Ceramic Materials are TAM Frits which Westinghouse engineers found unrivalled in their adaptability to the advanced design of new Westinghouse units. Not only do TAM Products enable Westinghouse to produce a superior enamel, but to accomplish it at lower cost.

In addition to TAM Frits, TAMCO supplies the ceramic industry with a wide variety of Zirconium opacifiers (TAM Opax and TAM Hy-Opax), glazes, fluxes, and refractories.

TAM Metallurgical Alloys (used indirectly by Westinghouse only as incorporated in metals obtained from outside mills and forges) consist of a wide variety of Titanium compounds promoting better, cleaner, more uniform metals, both ferrous and non-ferrous. TAM *Original* F. C. T. (Ferro Carbon-Titanium) No. 78, a cleanser for medium and high carbon steels, and TAM *Medium Carbon* F.C.T. No. 35 for soft steels are but two of many TAM Alloys used throughout the metal world.

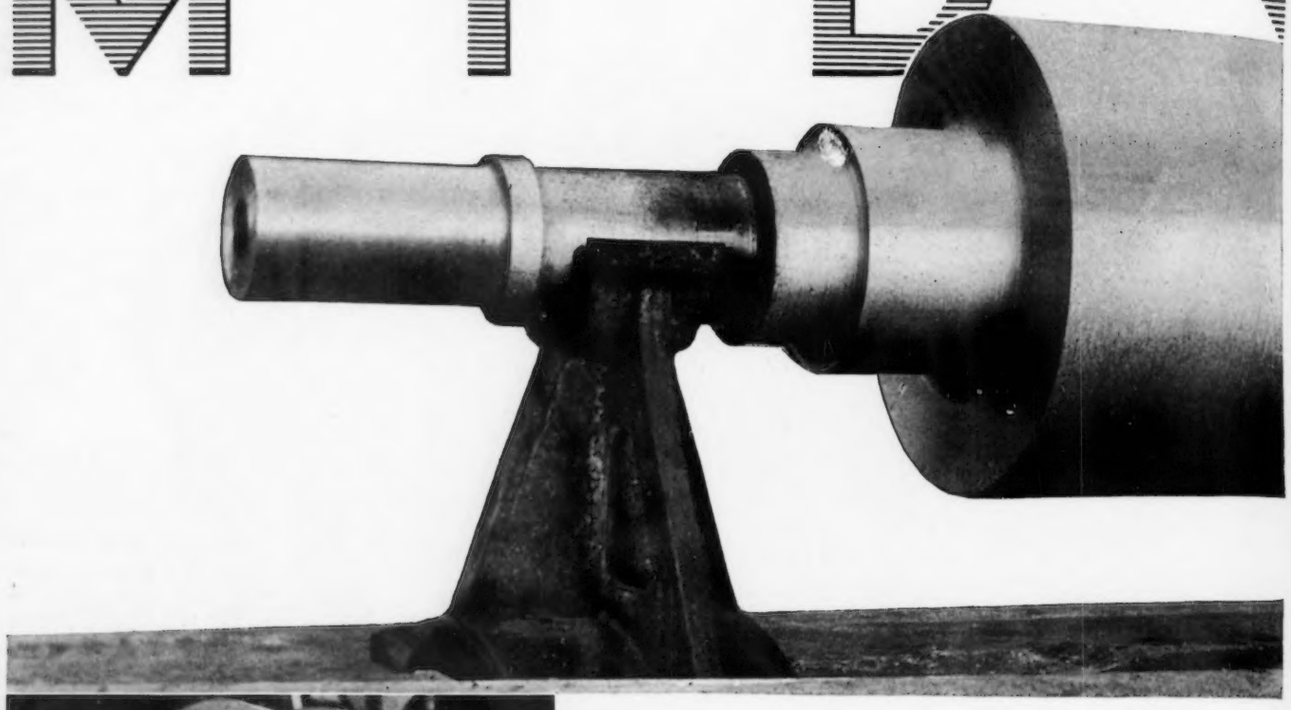
TAMCO offers to both the ceramic and the metal-producing industry the practical experience of many years search for better quality. To this end, the broad facilities of the TAMCO Laboratories are ever available!

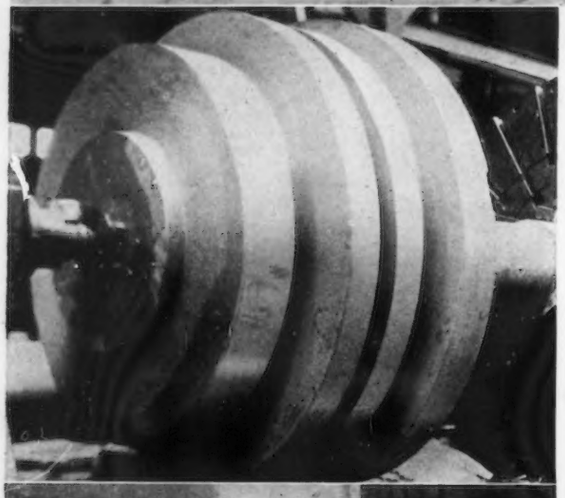
THE TITANIUM ALLOY MANUFACTURING CO.

TAM ZIRCONIUM TITANIUM PRODUCTS

GENERAL OFFICES AND WORKS: NIAGARA FALLS, N. Y., U. S. A. EXECUTIVE OFFICES: 111 BROADWAY, NEW YORK CITY

M I D







Westinghouse has but standard . . . . .

Fifty years is a short time in history —but a long time in human progress, particularly in manufacturing progress. Any organization whose lifetime spans the past fifty years, and at their end is in a position of acknowledged industrial leadership, must have unusual qualities. For conditions today are as different from a half century ago as it is possible to imagine.

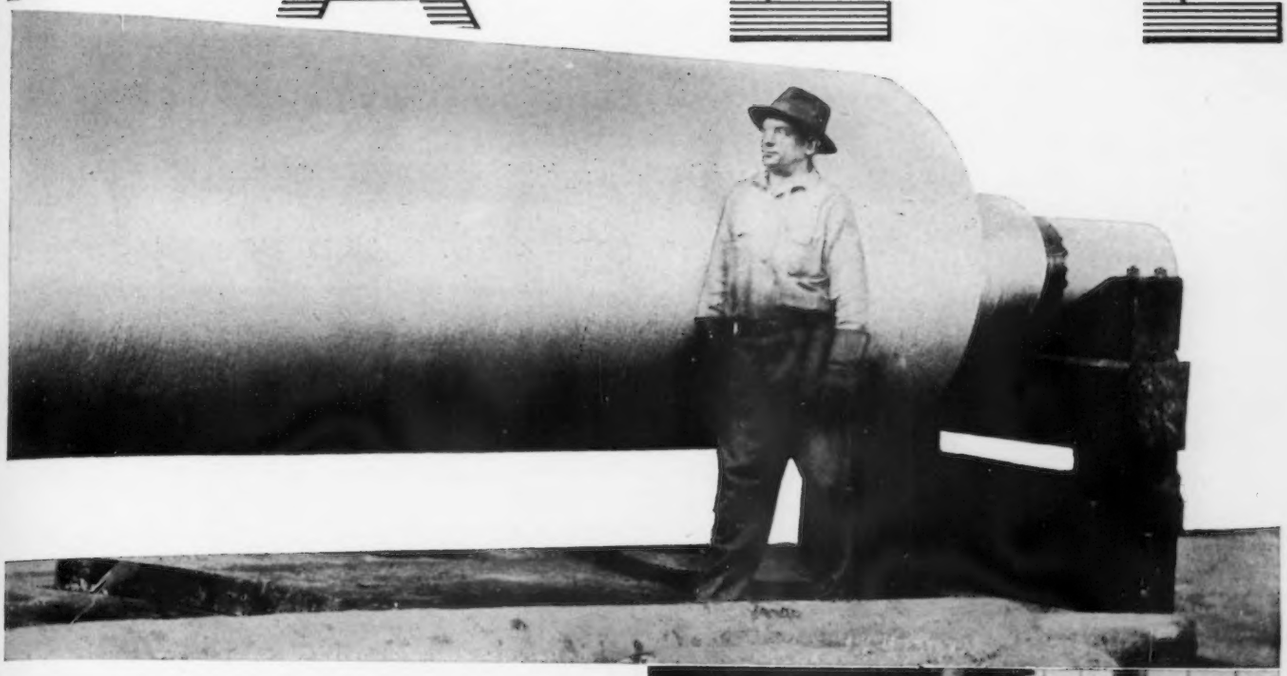
Westinghouse has such qualities,

THE MID

NICETOWN ·

OFFICES: *New York*
Cleveland

VALE

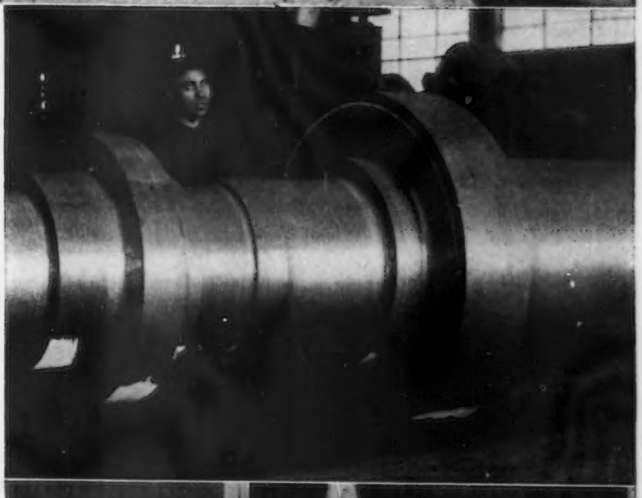


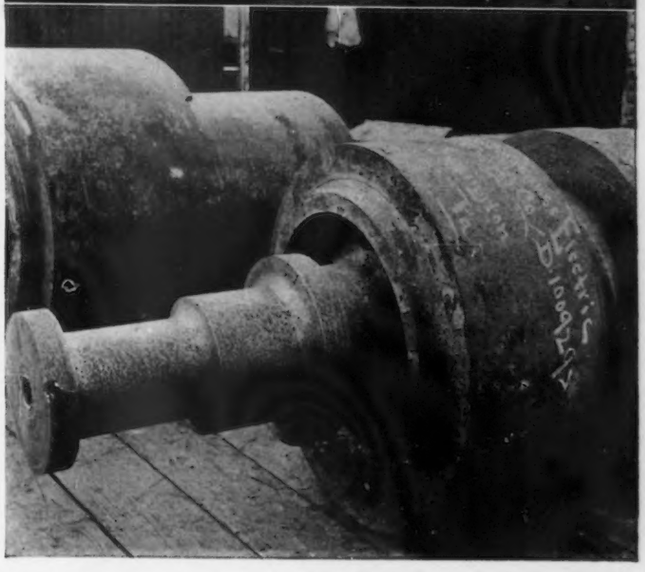
one acceptable

THE BEST

foresight, adaptability and, most essential of all, an insistence that every product bearing the name Westinghouse deserve that name. Midvale has the same pride in its ability to furnish Turbine Forgings which can withstand extreme dynamic stresses.

Midvale joins in the sincere wish that the next fifty years will find Westinghouse enjoying even more success than it possesses today.





VALE COMPANY

PHILADELPHIA, PA.

Chicago • Pittsburgh • Washington
San Francisco

STANDARD

STEEL CASTINGS

FORGINGS

ROLLED STEEL RINGS and FLANGES

CRANE and INDUSTRIAL WHEELS

SPRINGS ~ GEAR BLANKS

Acid Open-Hearth Steel Used in all "Standard" Products



One of five 63,000 lb. cast steel Turbine Runners made by "Standard"

STANDARD STEEL WORKS CO.

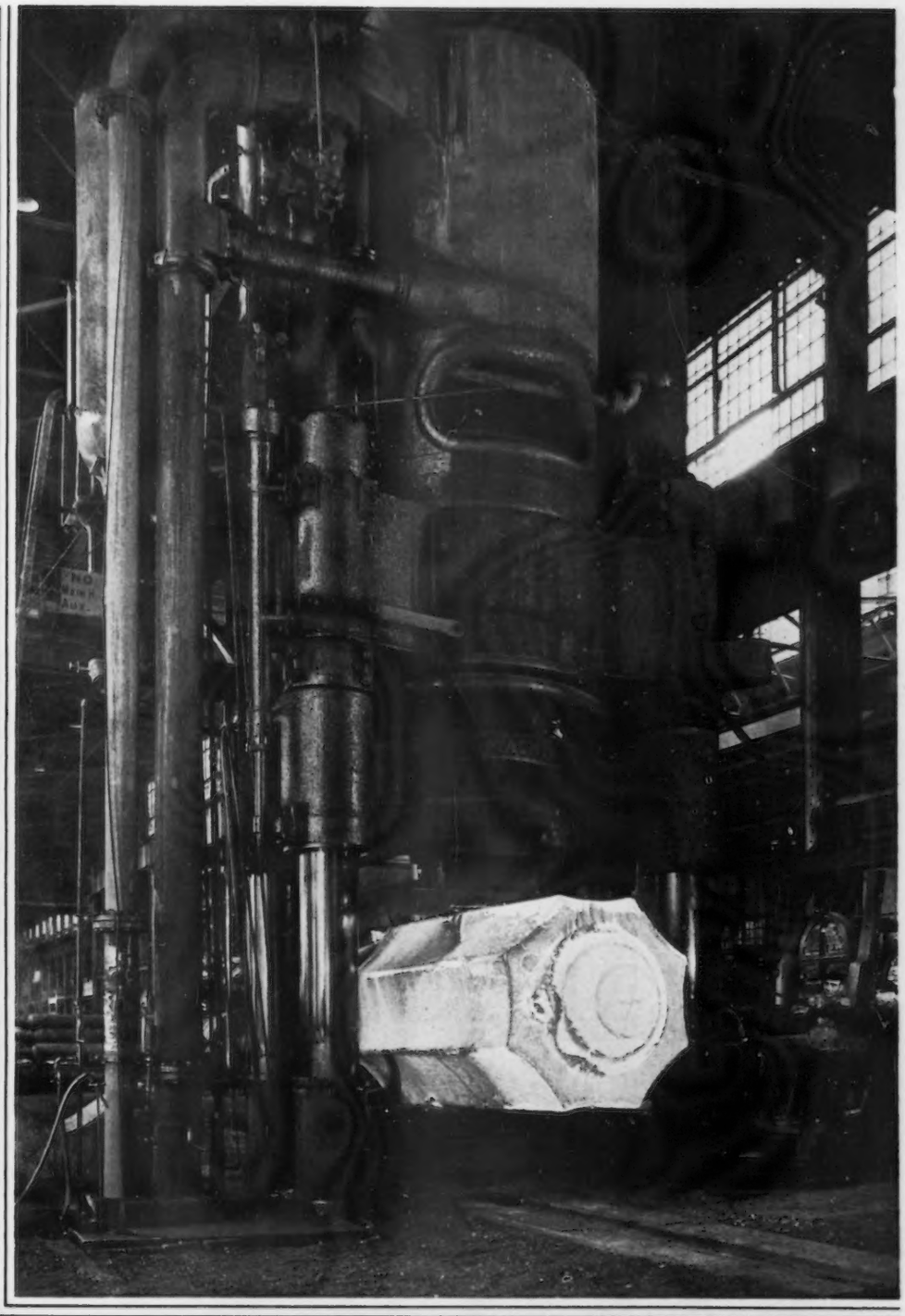
SUBSIDIARY OF THE BALDWIN LOCOMOTIVE WORKS

GENERAL OFFICES & WORKS: BURNHAM, PA.

NEW YORK
PHILADELPHIA

CHICAGO
ST. LOUIS

PORTLAND
SAN FRANCISCO



WESTINGHOUSE 1886 1936 GOLDEN JUBILEE

MESTA
FORGINGS
Carbon Steel
Alloy Steel

•

Rough Turned
or Finished
Complete

MESTA FORGINGS

MESTA MACHINE CO., PITTSBURGH

STAINLESS STEELS

SPECIAL ALLOY STEELS

MAGNET STEELS

LATROBE ELECTRIC STEEL CO.

LATROBE, PA.

HIGH-SPEED STEELS

DIE STEELS

CARBON TOOL STEELS

"MASSILLON" ELECTRIC STEEL CASTINGS

Satisfy Our Customers' Most Exacting Requirements

THE MASSILLON STEEL CASTING COMPANY

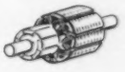
MASSILLON, OHIO

Co-Pioneers

IN IMPROVING PRODUCTS WITH PHENOL RESINOIDS

It is typical of the engineering leadership of Westinghouse Electric and Manufacturing Company that this great organization was among the first to recognize the far-reaching advantages of the phenol resinoids developed by Dr. Leo H. Baekeland. Collaborating with Bakelite Corporation, Westinghouse has established important milestones in the progress of product betterment.

1. Twenty-six years ago, Westinghouse applied the first commercial production of Bakelite Resin varnish to improve coil impregnation.



2. Bakelite Molded ignition parts produced by Westinghouse were forerunners of many standard applications of Bakelite Materials in modern motor cars.



3. During the World War, Westinghouse developed "bullet-proof" airplane propellers from Bakelite Laminated.



4. Present-day radio cabinets and tube bases originated in early applications of Bakelite Materials by Westinghouse.



5. Westinghouse Micarta gears were among the first of the silent Bakelite Laminated gears now in general use.



6. With Micarta, Westinghouse was one of the first to use Bakelite Laminated for table tops, trays and panelling.



These outstanding instances typify countless other useful applications of Bakelite Materials which are serving industry today. Opportunities for additional advantageous applications are practically unlimited. Write for comprehensive data on the numerous different Bakelite Materials available, contained in booklets 2M, "Bakelite Molded", 2L, "Bakelite Laminated" and 2V, "Bakelite Varnish."

BAKELITE CORPORATION, 247 PARK AVENUE, NEW YORK, N.Y.
BAKELITE CORPORATION OF CANADA, LIMITED, 163 Dufferin Street, Toronto, Ontario, Canada

BAKELITE

REGISTERED U.S. PAT. OFF.

"The registered trade marks shown above distinguish materials manufactured by Bakelite Corporation. Under the capital "B" is the numerical sign for infinity, or unlimited quantity. It symbolizes the infinite number of present and future uses of Bakelite Corporation's products"

THE MATERIAL OF A THOUSAND USES



PATENTED

PALNUT

LOCK NUTS

were selected in 1926 by Westinghouse engineers for use on transformers.

Today—ten years later—PALNUTS are still being used as standard on Westinghouse transformers and continue to be adopted by Westinghouse engineers for new applications.

It is interesting to note that PALNUTS were first used on aircraft engines at about the same time. Today they are the accepted standard on all aircraft engines built in this country for the Army, the Navy and all Commercial Airlines.

Perhaps you can use this type of lock nut to advantage too.

THE PALNUT COMPANY

63 Cordier Street, Irvington, N. J.

BOLTING

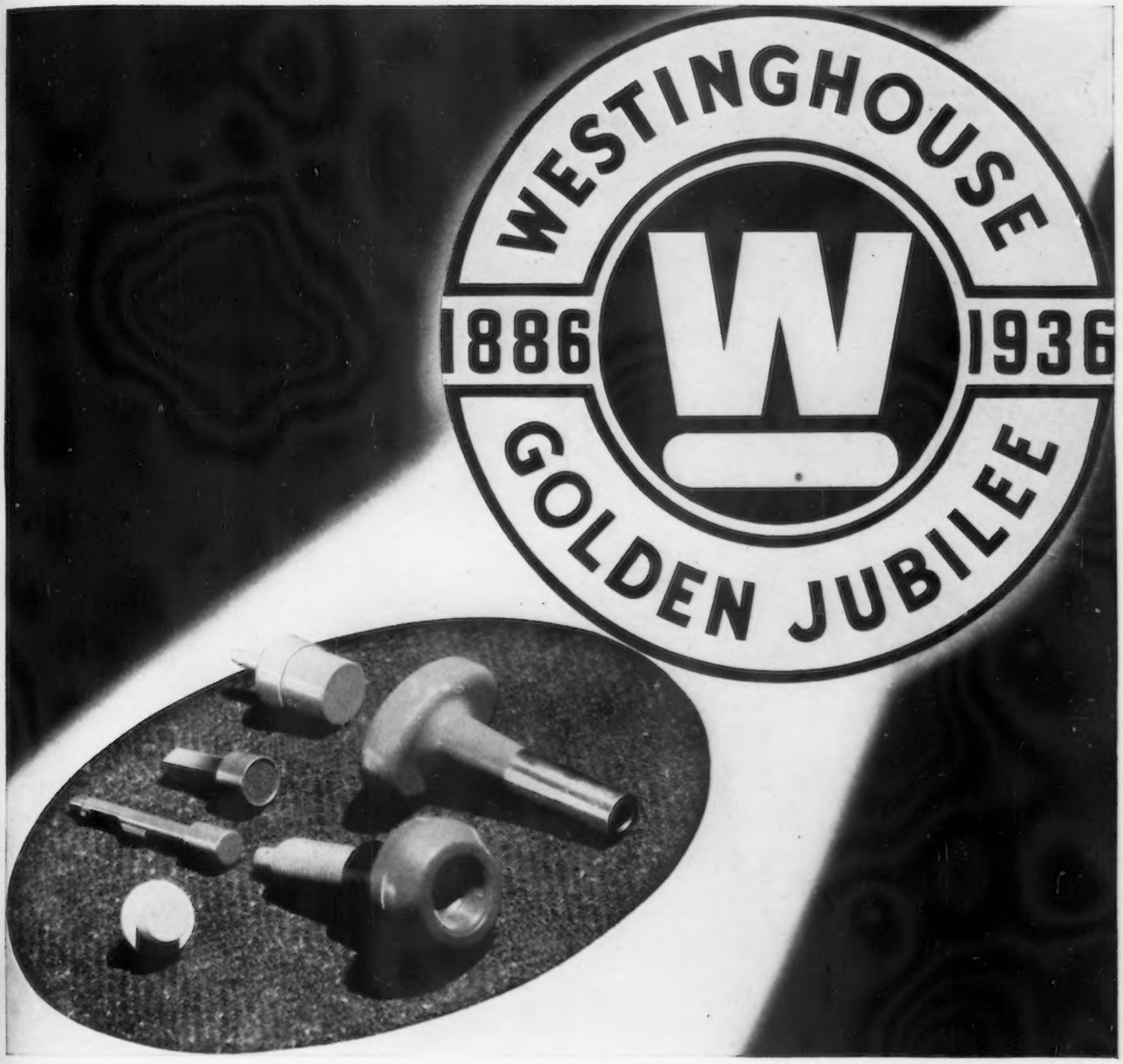
The Power Giants of Industry!



BOLTS and nuts play an important part in this Westinghouse 14,000 sq. ft. surface condenser. No compromising with quality here. That is why Westinghouse uses "Milton" Bolts and Nuts on big assemblies to withstand severe stresses. "Milton" Bolts and Nuts are something more than ordinary bolts and nuts. Besides accuracy they possess unusual strength and stamina due to the special analysis steel of which they are made.

A large stock of machine, carriage, lag bolts, etc.—also cold punched, semi-finished, slotted and hot pressed nuts assures prompt shipments.

THE MILTON MFG. CO., MILTON, PA.



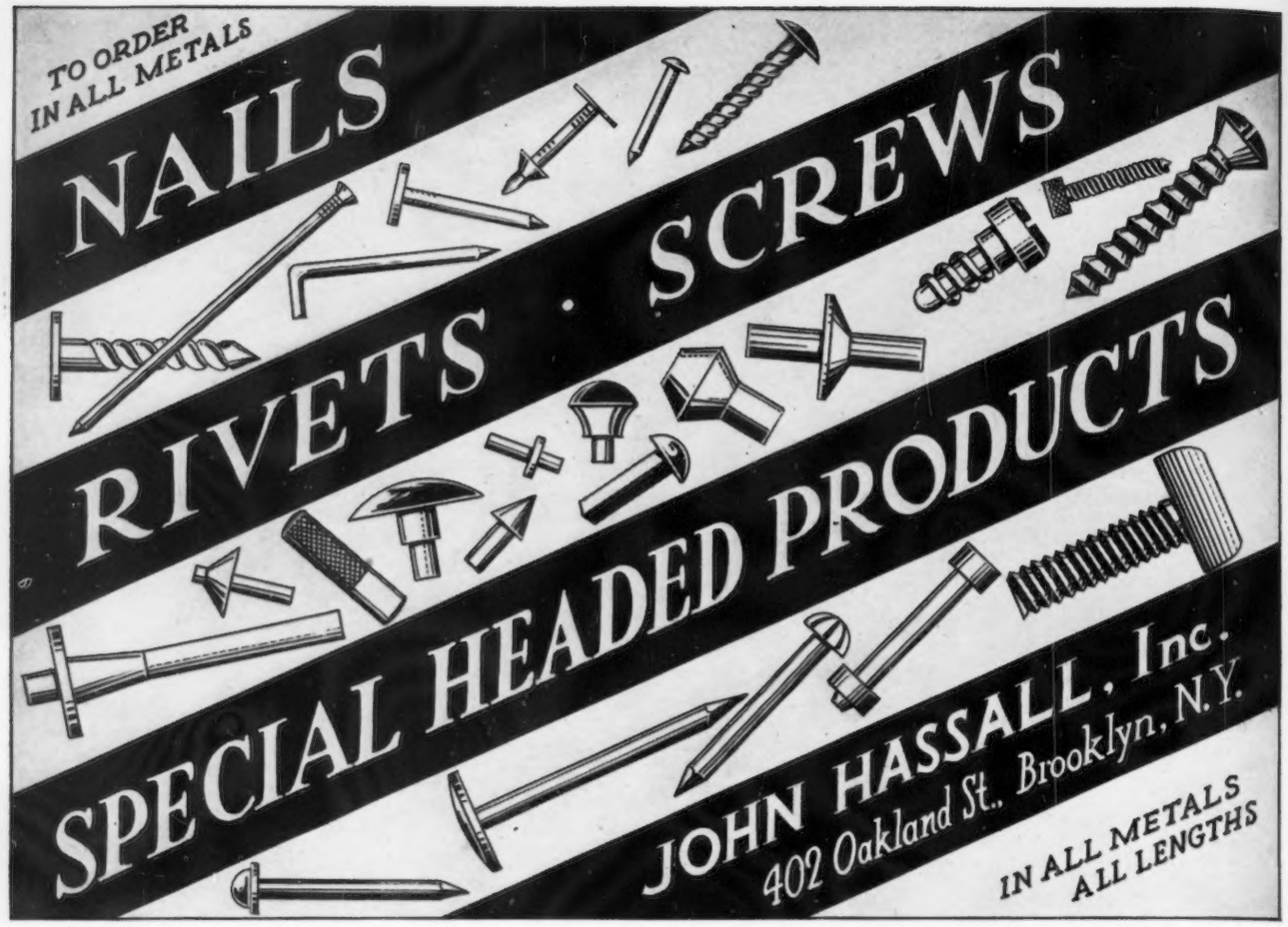
Small but vital . . . Westinghouse control knobs molded of Durez

50 YEARS OF GROWTH AND ACHIEVEMENT

In 1886 there was no Durez . . . no material which was dielectric, chemically inert, strong, wear-proof, and which could be formed and finished in one fast, simple operation. Westinghouse, always alert to new methods, new materials, was one of the first to recognize the value of molded plastics when they arrived. Since then, Durez has considered it an honor to accept, year after year, the Westing house challenge of "Better". ***General Plastics, Inc., 16 Walck Road, North Tonawanda, N. Y.

DUREZ

THE MODERN MOLDING COMPOUND



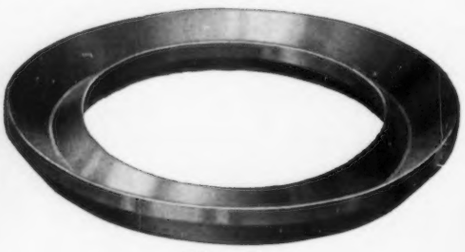
Reg. U. S. Pat. Office

X-L MECHANICAL LEATHERS and WASHERS for ALL PURPOSES

● Send Us Specifications or Samples for Prices!

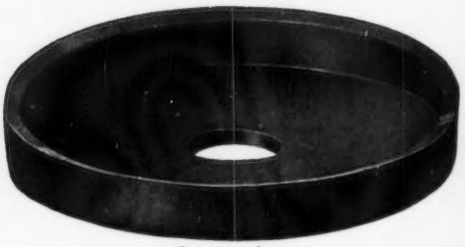


Leather Specialties



"V" Leather

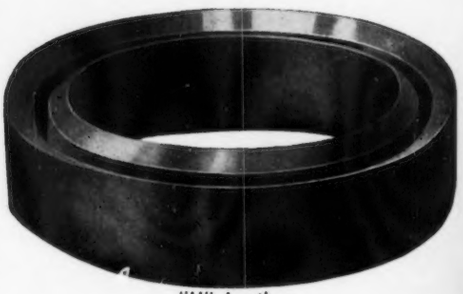
● **Nothing Takes the Place of Leather**



Cup Leather



Flange Leather



"U" Leather

Excelsior Leather Washer Mfg. Co., Inc.
Rockford Illinois

WESTINGHOUSE PRODUCTS KEEP

TIGHT

FOR *life*



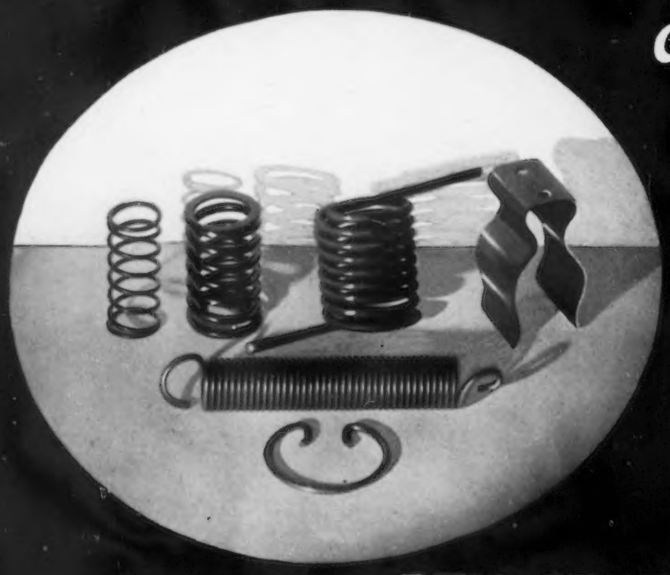
BECAUSE *Live Action* COMPENSATES FOR WEAR AND LOOSENESS

Today . . . countless products leave Westinghouse plants tight, smooth-running, rattle-free—but how will they be *tomorrow?* Will they withstand the relentless attacks of wear and vibration? They *will*—because they are equipped with SPRING WASHERS—SPRING WASHERS with range of action to compensate for wear and looseness. *Live Action* will keep your product *tight for life.*

SPRING WASHER INDUSTRY
616 WRIGLEY BLDG. • CHICAGO, ILL.

LEE-BUILT SPRINGS

a little higher a lot better



In your product it is the little details that count—springs that respond unfailingly—springs that last—LEE SPRINGS.

Send for handy Lee Spring Specification Forms— a great convenience in specifying springs.

LEE SPRING COMPANY, Inc.

30 MAIN STREET • BROOKLYN, N. Y.

A—WESTINGHOUSE ELECTRIC & MFG. CO.—SOURCE OF SUPPLY

Quality *Service*

EAGLE BRAND METAL PRODUCTS

REGISTERED TRADE MARK

WIRE FORMS—**SPRINGS**—STAMPINGS

Miller & Van Winkle, Inc.

18 BRIDGE STREET BROOKLYN, N. Y.

Established 1883

STAMINA!

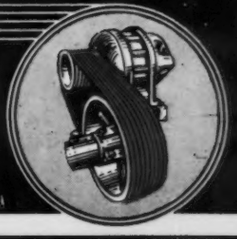
In this new Duro-Brace Texsteel Sheave, for Texrope V-Belt Drives, an outstanding, modern design, combines with the finest materials and with manufacturing methods derived from vast experience, to give you a sheave that will withstand the severest duty. • The outside walls of this sheave are reinforced by convex steel plates which so greatly increase their strength as to eliminate distortion, even under extreme overloads; thus giving a light, true running drive always. • Duro-Brace Texsteel Drives are 98.9% efficient . . . Require no lubrication or belt dressing . . . Are unaffected by moisture or dust . . . Are shock-absorbing, vibrationless, slipless, silent and clean. • Mail us a card asking for Bulletin No. 2188 which sets forth the advantages that Duro-Brace Texsteel Drives offer you in all matters of power transmission, whether they be simple or complex.



New Duro-Brace Design: cross-section showing outside plate braced by a convex reinforcing steel plate.

TEXROPE DIVISION

ALLIS-CHALMERS



MILWAUKEE WISCONSIN

Reduces

GEAR NOISE

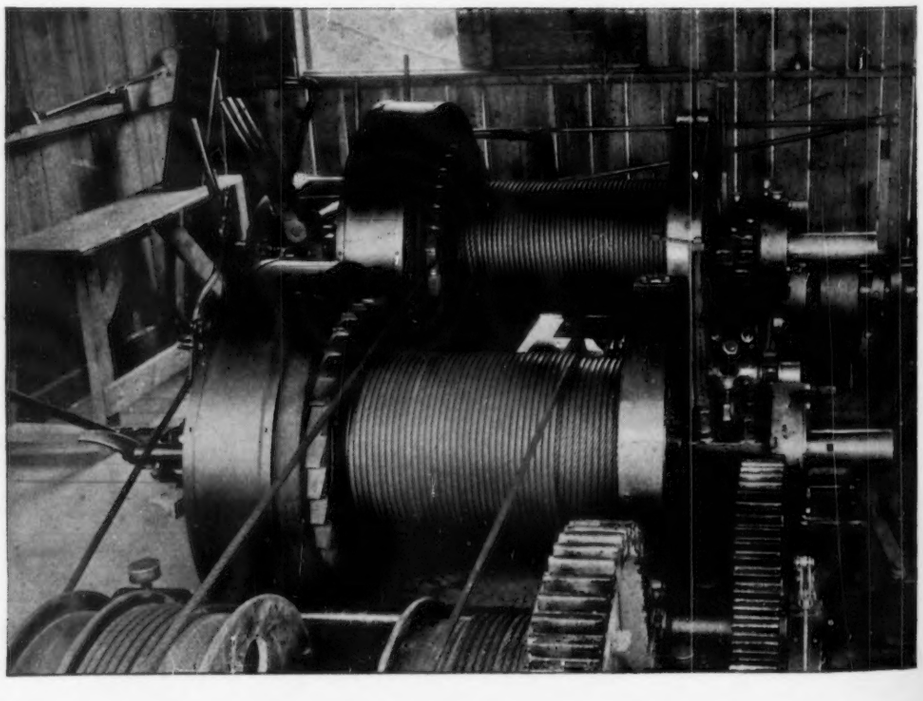
Many shop men just won't believe that a gear lubricant can possibly make *such an immediate difference.*

So they go on . . . submitting to that incessant, deafening clank and ring of metal-to-metal contact . . . and the almost constant need of lubrication.

By cleaning off all old lubricant, and applying Texaco Crater Compound, you can immediately have your gears running quieter. Man-hours for application will be greatly reduced and the cost of lubricant will be less.

Crater coats gear teeth with a viscous, pressure-proof, wear-resisting film that clings to the surface and protects each tooth against its arch-enemy—wear.

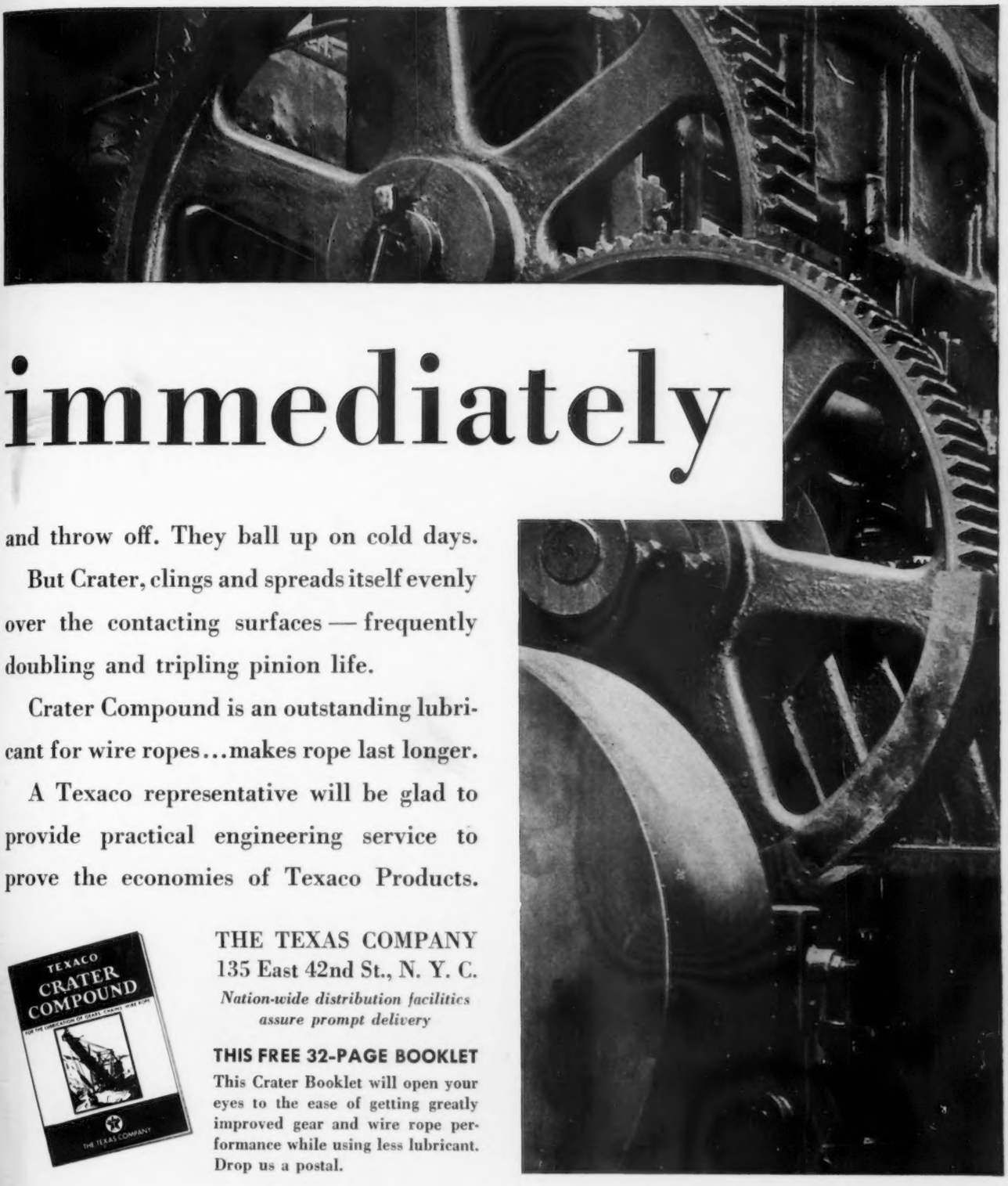
Ordinary lubricants have the tendency to "channel," squeeze out at sides of the gears,



WIRE ROPE—will give you long years of extra service when sealed in a tough, viscous, waterproof coating of Crater. Each wire in each strand will be protected indefinitely, as Crater clings in all climatic temperatures. No grease can compare for this service.

TEXACO

REG. T. M.



immediately

and throw off. They ball up on cold days.

But Crater, clings and spreads itself evenly over the contacting surfaces — frequently doubling and tripling pinion life.

Crater Compound is an outstanding lubricant for wire ropes...makes rope last longer.

A Texaco representative will be glad to provide practical engineering service to prove the economies of Texaco Products.

THE TEXAS COMPANY
135 East 42nd St., N. Y. C.
Nation-wide distribution facilities assure prompt delivery

THIS FREE 32-PAGE BOOKLET

This Crater Booklet will open your eyes to the ease of getting greatly improved gear and wire rope performance while using less lubricant. Drop us a postal.

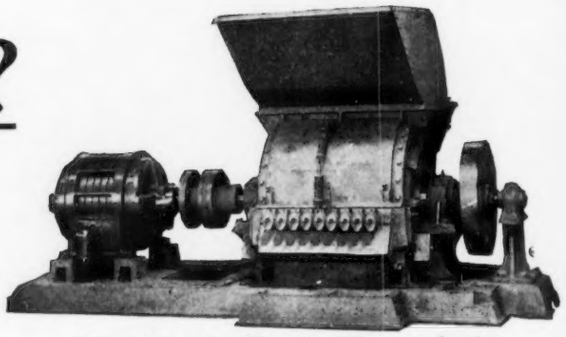
TEXACO
Industrial Lubricants

Extra Profits?

Many shops and manufacturing plants are making extra profits by crushing their turnings into chips with American Ring Steel Turning Crushers. Chips not only bring a higher price, but they are easy to handle, require less storage space and are easier to ship.

Your long turnings will cease to be a nuisance after you put an American Ring Crusher on the job. It will pay for itself in a very short time, after which it will pay you a large weekly profit.

Do you want this **extra** profit?



No. 3800 American Ring Steel Turnings Crusher with hopper mounted on bed plate. (Patented)

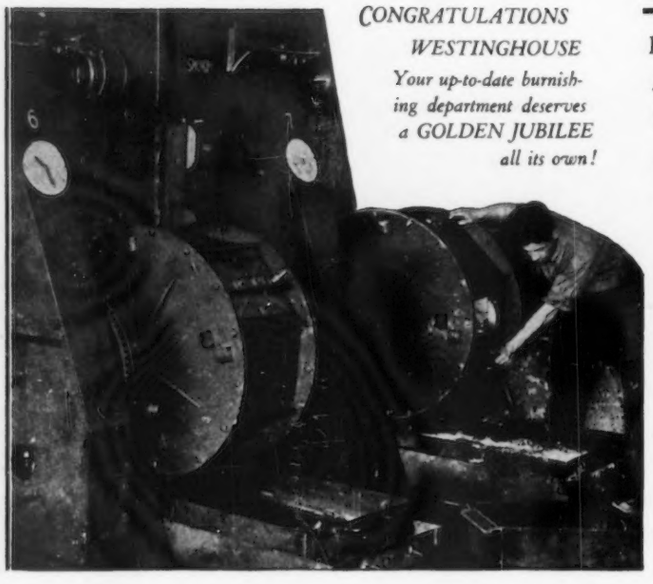
AMERICAN Ring Crushers are crushing run-of-mine coal to stoker size at maintenance costs as low as 1/10 of a cent a ton.

ORIGINATORS OF THE ROLLING RING CRUSHER PRINCIPLE

American Pulverizer Co., St. Louis, Mo.

1439 Macklind Avenue

Lean Toward Low-Cost Finishing



CONGRATULATIONS WESTINGHOUSE

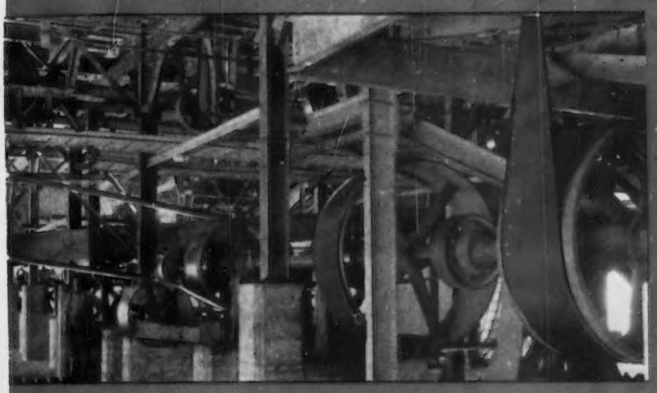
Your up-to-date burnishing department deserves a GOLDEN JUBILEE all its own!

Here are barrels 6 and 7 of the large Abbott burnishing installation at the Westinghouse East Springfield plant. Such a corner earns profits in any plant where small metal parts require a fine, bright finish. Check up on this practical way to improve and speed up production, and provide quicker turnover of working capital. Write us for the complete story on barrels and steel burnishing materials. The Abbott Ball Company, 1047 New Britain Ave., Hartford, Conn. « « «

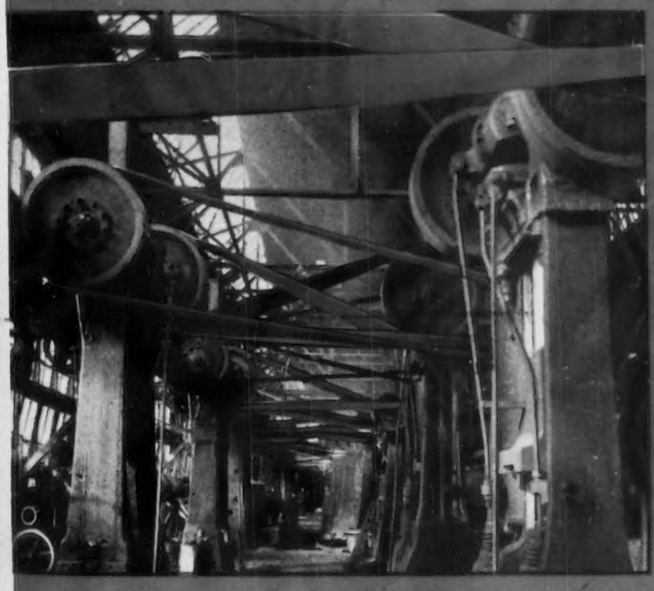
with Abbott Ball Burnishing



In a coal mine



In a hardwood lumber mill—on a main pulley shaft



In a steel mill

Condor Compensated

TRADE MARK REGISTERED

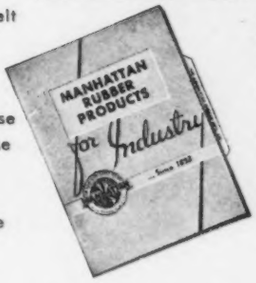
PATENTED

THE LOW TENSION RUBBER BELT for INDUSTRIAL DRIVES

Used on the varying types of drives throughout industry. Condor Compensated is the low tension rubber belt with equalized ply stresses over pulleys. It has amply demonstrated its efficiency, economy and dependability . . . Twelve outstanding advantages over standard rubber belting cause a rapidly growing number of manufacturers who are determined to get maximum operating economy to specify Condor Compensated. It handles peak loads with minimum slip, holds fasteners three to four times longer and does not stretch nor shrink. Plies do not rupture because they are equalized . . . The installations shown are typical of the difficult service drives on which Condor Compensated Belt performs with record efficiency.

Condor PRODUCTS

Transmission Belt
V-Belt
Conveyor Belt
Air Hose
Contractors Hose
Sand Blast Hose
Suction Hose
Fire Hose
Hydraulic Hose
Steam Hose



Water Hose
Chute Lining
Launder Lining
Industrial Brake Blocks and Lining
Molded Rubber Goods
Rubber Lined Tanks
Rubber Covered Rolls

Rubber Bonded Abrasive Wheels

Write for New Catalog

THE MANHATTAN RUBBER MFG. DIVISION

OF RAYBESTOS-MANHATTAN, INC.

EXECUTIVE OFFICES and FACTORIES, 32 TOWNSEND ST., PASSAIC, N. J.

for MACHINE *Performance*
specify MODERN
Chain Drives

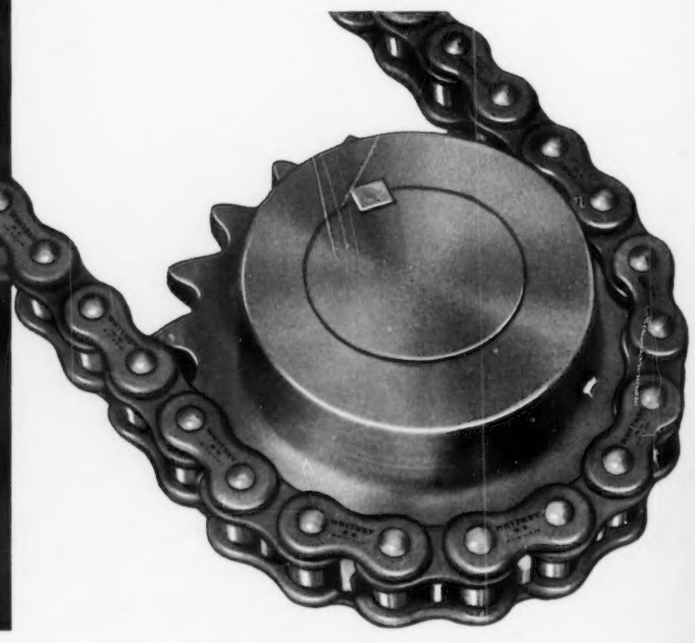


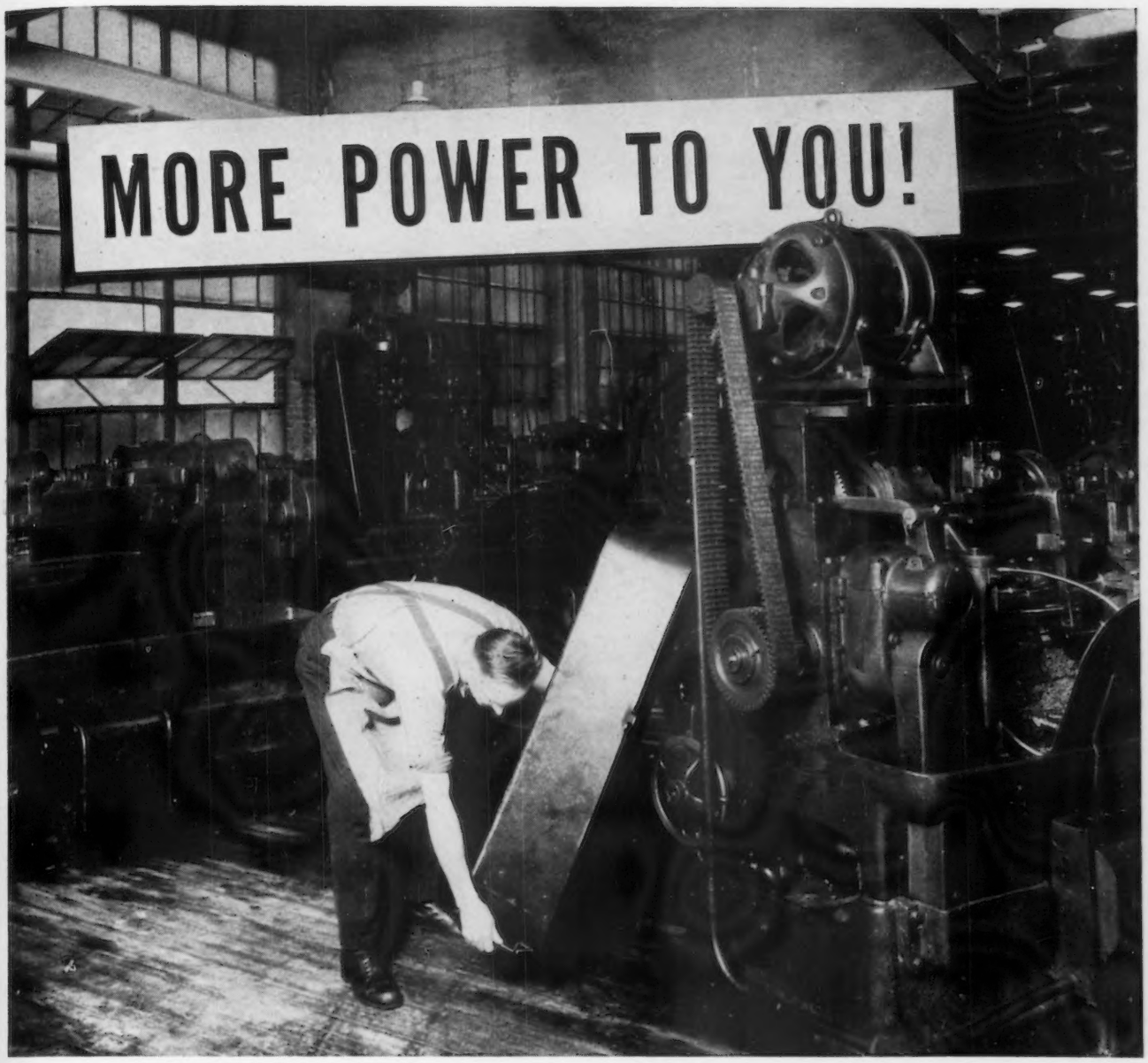
Chain drives gain increasing acceptance year by year as a means to profitable machine performance. The field of application for this positive and efficient power transmission medium has constantly widened, because modern chain drives have kept in step with improved manufacturing methods and materials.

Whitney Chain Drives are recognized as outstanding in performance. They have strength for the most severe operating conditions and a high resistance to wear, which helps to maintain original accuracy and smoothness of operation.

Whitney Chain Drives are specified by leading designers, manufacturers and plant engineers. Their inherent characteristics allow a freedom of design which is unequalled by other types of drives. Whitney engineers can offer valuable suggestions on your power transmission problems. Write today for further information.

The Whitney Chain & Mfg. Co., Hartford, Conn.





GREETINGS

TO AN OUTSTANDING AMERICAN INSTITUTION

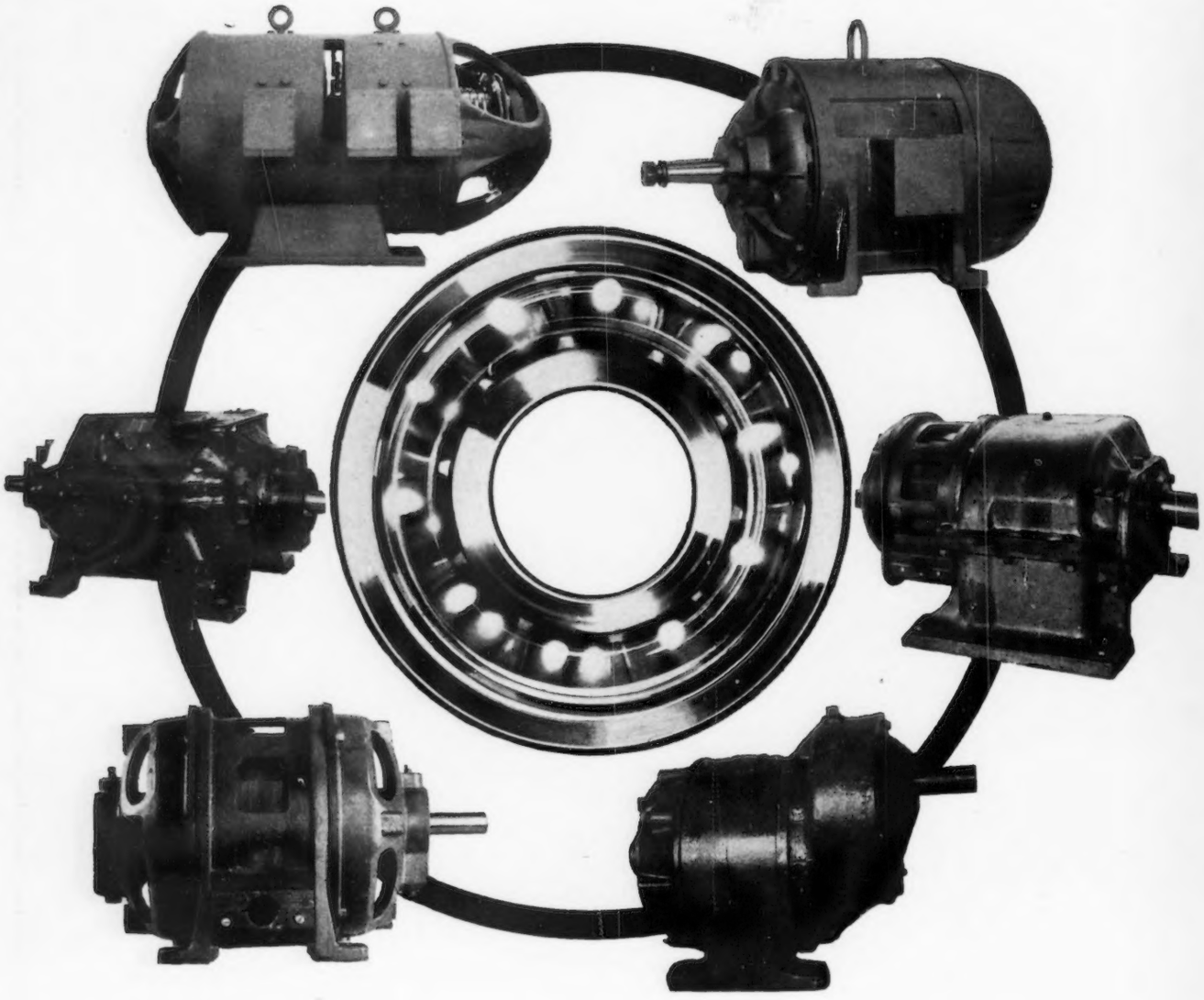
WESTINGHOUSE is more than the name of a company. Its fiftieth birthday is more than an anniversary. Westinghouse is an outstanding industrial institution whose 50 years of service is, alike, an inspiration and a challenge to all. To those to whom the word "power" is so pertinent and meaningful, may we say "more power to you!"

MORSE CHAIN COMPANY • ITHACA, NEW YORK • DETROIT, MICH.

DIVISION OF BORG-WARNER CORPORATION

MORSE *Positive* DRIVES

SILENT CHAIN and ROLLER CHAIN DRIVES • COUPLINGS • CLUTCHES



WESTINGHOUSE

entrusts the loads to FAFNIR

A complete range of Westinghouse Electric Motors is equipped with Fafnir Ball Bearings. No small responsibility this, but one which Westinghouse knows from experience can safely be entrusted to Fafnir.

So complete is the range of Fafnir Ball Bearings in types and sizes that the ideal bearing is assured. In quality of workmanship, material and design Fafnir Ball Bearings are unexcelled. Moreover, Westinghouse, like innumerable other manufacturers, has learned that the accumulated experience of Fafnir engineers is insurance of efficient application.

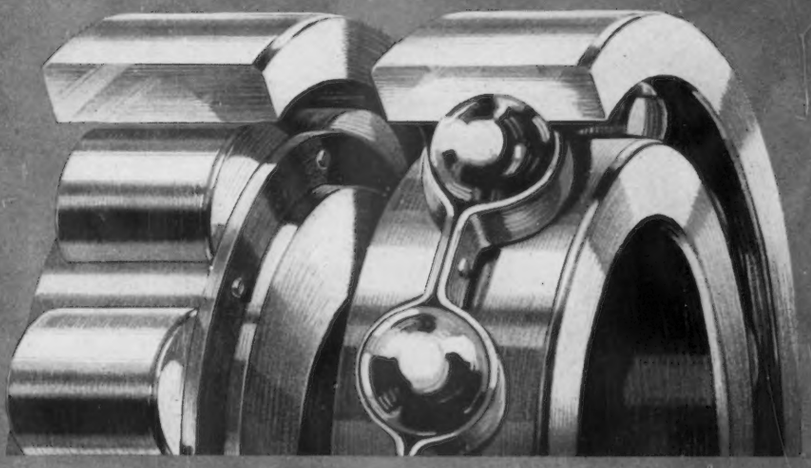
Give your machines this protection which promotes lasting efficiency. It is available for every gear, wheel and axle from "the most complete line of ball bearings in America." The Fafnir Bearing Company, *New Britain, Conn.* . . . Atlanta . . . Chicago . . . Cleveland . . . Dallas . . . Detroit . . . Kansas City, Missouri . . . Milwaukee . . . Minneapolis . . . New York . . . Philadelphia.



You will find interesting facts about modern machines in every issue of Fafnir's house organ, "The Dragon." We will gladly add your name to the mailing list.

FAFNIR BALL BEARINGS

TWIN PRECISION



"NORMA-HOFFMANN"

BALL & ROLLER BEARINGS

WE review with pleasure our association of 25 years with the Westinghouse Company, as suppliers of NORMA-HOFFMANN PRECISION BEARINGS. Throughout that period, it has been the privilege of our engineers—working with those of Westinghouse—to participate in many of the notable advances in electrical equipment with which the name "Westinghouse" is identified. We congratulate the Westinghouse Company on its 50 years of achievement, and pay our tribute to its high standards.

NORMA-HOFFMANN BEARINGS CORPN.—STAMFORD CONN. U.S.A.

FEDERAL BEARINGS



CHROME alloy steels of the highest grades, designs correct in every detail and minute attention to every process of manufacture, with frequent tests and rigid inspections; these are the fundamental factors in FEDERAL BALL BEARING quality. Nothing is left to chance; nothing slighted.

Every FEDERAL can be bought and used with confidence and the assurance that the industry produces nothing better in ball bearing efficiency.

THE FEDERAL BEARINGS CO., INC.
POUGHKEEPSIE, N. Y.
Makers of Fine Ball Bearings
Detroit Sales Office: 2608 Book Tower
Chicago Sales Office: 120 N. Peoria St.





WESTINGHOUSE
1886 W 1936
GOLDEN JUBILEE

BALL
BEARINGS
SKF
ROLLER
BEARINGS

Symbols of

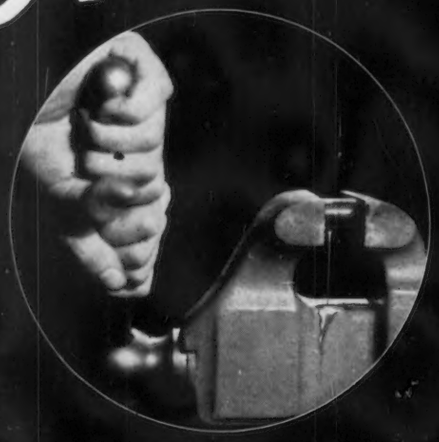
PIONEERING AND PERFORMANCE

● Two famous trademarks and three famous letters — one symbolizing 50 years of development in the electrical industry; the other an equally progressive accomplishment in the field of anti-friction bearing engineering. Westinghouse has pioneered in the manufacture of electrical products — SKF pioneered the application of anti-friction bearings to electric motors. We congratulate the Westinghouse Electric & Manufacturing Company on its 50th anniversary.

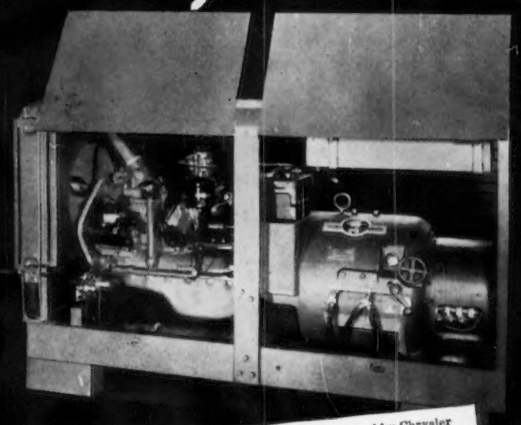
3671

SKF INDUSTRIES, INC., FRONT ST. & ERIE AVE., PHILADELPHIA, PA.

Oilite Industrial Engines



An Oilite test for strength and oil content



Westinghouse engine-driven arc-welder, powered by Chrysler

co-operating with industry

CHRYSLER CORPORATION closely resembles other great corporations built on the policy of service to individuals and industry. Co-ordinating engineering and administration with ever expanding gigantic manufacturing facilities has gained for Chrysler world acceptance of its products.

The Chrysler organization . . . engineering staff . . . manufacturing plants and production executives . . . capable and forward looking administrative group . . . have been, *and are*, available for industry. Oilite bearing material, and many types of industrial engines, as well as all new Chrysler developments, can be obtained by industry through Amplex, the industrial unit of Chrysler Corporation.

CHRYSLER INDUSTRIAL ENGINES were quickly accepted by industry . . . were accepted for the day-after-day working qualities of these rugged, dependable, and economical power plants. Chrysler Industrial Engines are adaptable to many types of work . . . are available in many sizes, with either gasoline or natural gas equipment.

OILITE. Chrysler's self-lubricating bronze bearing material, has been specified for years by industrial leaders. Oilite bearings are quiet, feed oil without dripping, have very high ductility, unusual strength, and low co-efficient of friction. High oil content provides a hydraulic cushion for withstanding severe pressures and shock loads.

Chrysler Corporation expresses its appreciation for the fine co-operation extended by the engineering, purchasing and manufacturing staffs of industrial leaders.

CHRYSLER CORPORATION
AMPLEX DIVISION, DETROIT



A splendid profit opportunity is open to mill supply wholesalers in those markets where distribution of Bunting products is now being reorganized and expanded. The line includes: Over 600 stock sizes of completely machined and finished Standardized Bronze Bearings and Bushings. Machined and centered Cored and Solid 13" Bronze Bars in 121 stock sizes. A new and sensationally superior industrial anti-friction Babbitt. The Bunting wholesaler is powerfully supported by consistent heavy advertising and a protective sales policy of limited distribution, assuring ample volume to all outlets. No other line is so well or widely known. Write at once for data on the Bunting franchise. The Bunting Brass & Bronze Company, Toledo, Ohio. Branches and Warehouses in All Principal Cities.

BUNTING Quality

BRONZE BUSHINGS • BEARINGS
MACHINED AND CENTERED BRONZE BARS
ANTI-FRICTION METAL

AMERICAN CHAIN LIFTS 92½ TONS

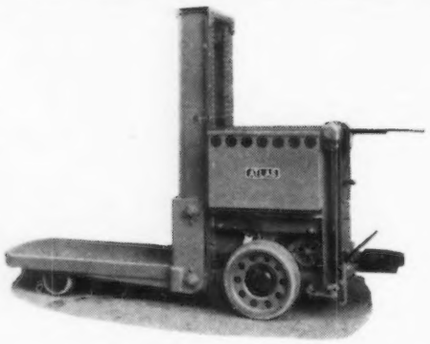


● Here is a test of chain construction, a proof of chain responsibility. • The job called for "shaking out" a huge casting. With its cores the weight was a good 185,000 pounds—dead weight to be lifted straight up. • Not a single link in those chains must part. A broken chain, a chain pulled stiff, might mean wreck beyond reckoning. Think of re-pouring 92½ tons of molten metal. There must be no guessing here. • So the AMERICAN CHAIN COMPANY, Inc. was called upon to deliver crane chains equal to the task. The photograph shows them at work—proof of the perfect welding of sturdy metal. • For welded and weldless chain of all kinds and the chain attachments that go with them specify products of the American Chain Company—where methods, men and materials are held to the highest standard.

AMERICAN CHAIN COMPANY, Inc.
Bridgeport, Connecticut
Sales Offices: New York, Pittsburgh, Chicago, San Francisco, York, Pa.

ACCO

IN BUSINESS FOR YOUR SAFETY



3 Ton High Lift Truck. Spur Gear Drive.

ATLAS HAULAGE EQUIPMENT REDUCES
Interplant Transportation Costs

We have built Cars and Locomotives for every conceivable haulage condition and for all materials including bulk raw materials, materials in process and finished products.

ATLAS PRODUCTS

Gas-Electric and Diesel-Electric Locomotives

Electric Transfer Cars for Blast Furnaces and Steel Plants

Stockhouse Scale Cars for Blast Furnaces

Concentrate and Calcine Cars for Copper Refineries

Automatic and Remote Controlled Electric Cars

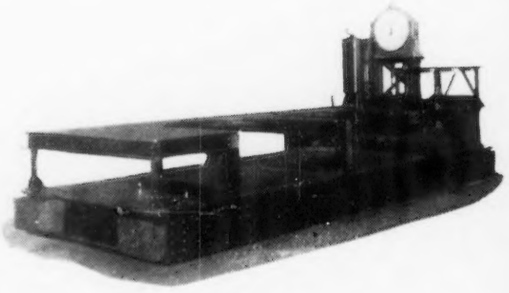
Pushers, Levellers and Door Extractors

Coal Charging Lorries, Coke Guides and Clay Carriers

Atlas Patented Coke Quenching Cars for By-Product Coke Ovens

Atlas Patented Indicating and Recording Scales

Special Cars and Electrically Operated Cars for every conceivable purpose.

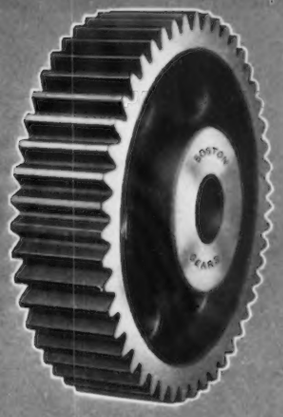


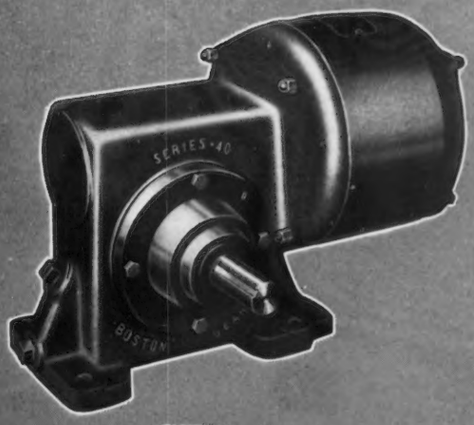
4 Ton Cupola Scale Charging Car with wells for 42" Buckets provided with Atlas Indicating Dial Mechanism.

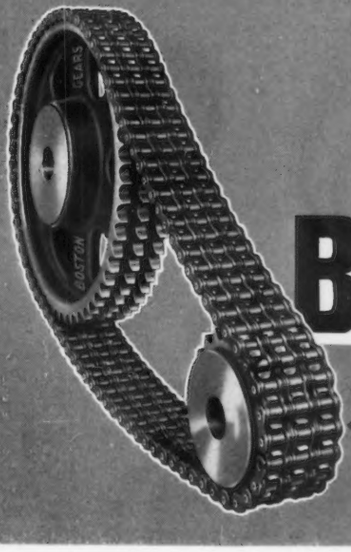
THE ATLAS CAR & MFG. CO.
Engineers — Manufacturers
CLEVELAND, OHIO

Immediate Delivery!

DISTRIBUTION POINTS FROM COAST TO COAST







THOUSANDS OF TYPES AND SIZES *in Stock!*

MORE THAN 2,000 DIFFERENT TYPES AND SIZES OF GEARS!

SPEED REDUCERS, INCLUDING BOSTON GEAR RATIO-MOTORS (Motorized Speed Reducers), IN 700 DIFFERENT RATIOS, TYPES, AND SIZES!

MORE THAN 350 DIFFERENT CHAIN DRIVES AND 600 DIFFERENT SIZES OF SPROCKETS!

Other Boston Gear STOCK Products Include:

Ball bearings, universal joints, shaft supports, flexible couplings, shaft couplings, pulleys, pillow blocks, bushings, collars, washers, ball bearing casters, etc.

SEND FOR CATALOG IA 750

giving complete prices and specifications and addresses of distribution points.

BOSTON GEAR WORKS, INC.

NORTH QUINCY, MASSACHUSETTS, U. S. A.

MEMBER OF AGMA

Direct Factory Branches in Boston, New York, Philadelphia, Cleveland, and Chicago. Sales Offices in Rochester, N. Y., Utica, N. Y., Dayton, Ohio, and Springfield, Mass.

A. T. & T. CO. TELETYPEWRITER CONNECTIONS

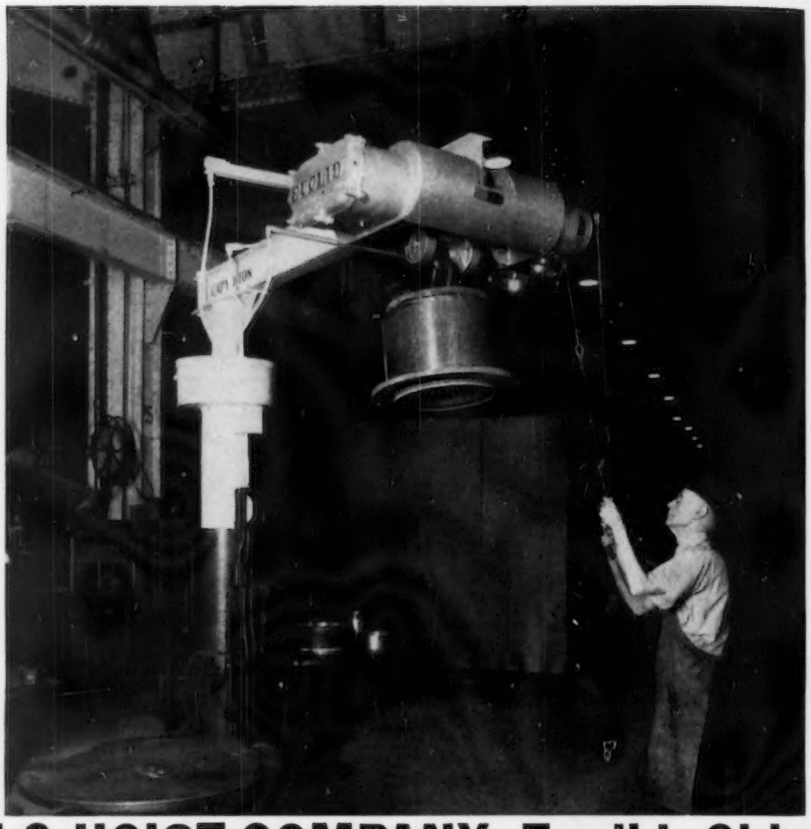
BOSTON GEAR *stock* PRODUCTS

Is the **HEADROOM** *Limited?*

The one ton capacity special hoist illustrated raises the hook to within 8½" of the underside of the beam.

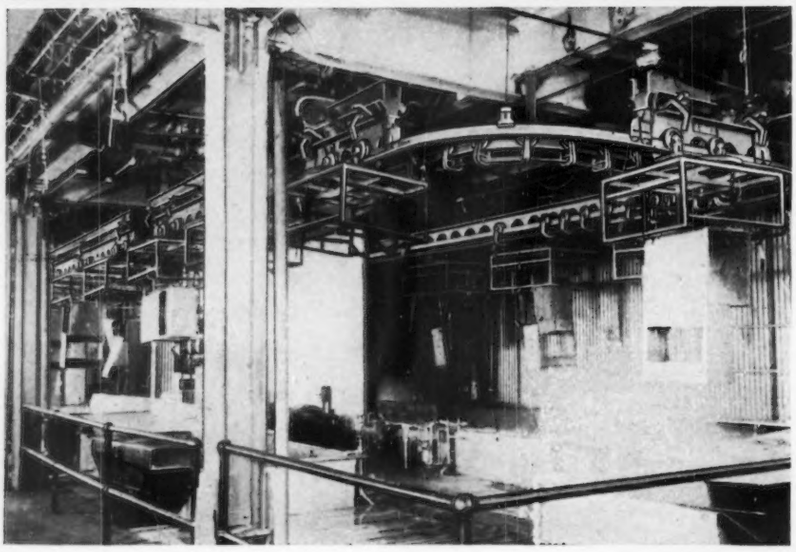
This is only one of 150 Euclid cranes and hoists purchased by the Westinghouse Company during the past twenty years. Such universal use proves their satisfactory performance.

A Euclid standard hoist will fill the requirements in the majority of cases, but if you have a problem of limited headroom, of unusual speed requirements, or exceptional precision of control—write us. We like the hard jobs.



THE EUCLID CRANE & HOIST COMPANY, Euclid, Ohio

OVERHEAD MATERIALS HANDLING



CLEVELAND TRAMRAIL

as used by Westinghouse in the Range and Refrigerator plant at Mansfield, Ohio.

This installation consists of Rail, Switches and Automatically Time Controlled Drop Sections over which numerous racks suspended from standard hand operated carriers are propelled through the cleaning and bonderizing process in the lacquer finishing department, by means of a specially designed and time controlled reciprocating pusher.

Numerous and various other installations of Cleveland Tramrail equipment have been made in plants of the Westinghouse Electric & Manufacturing Company.

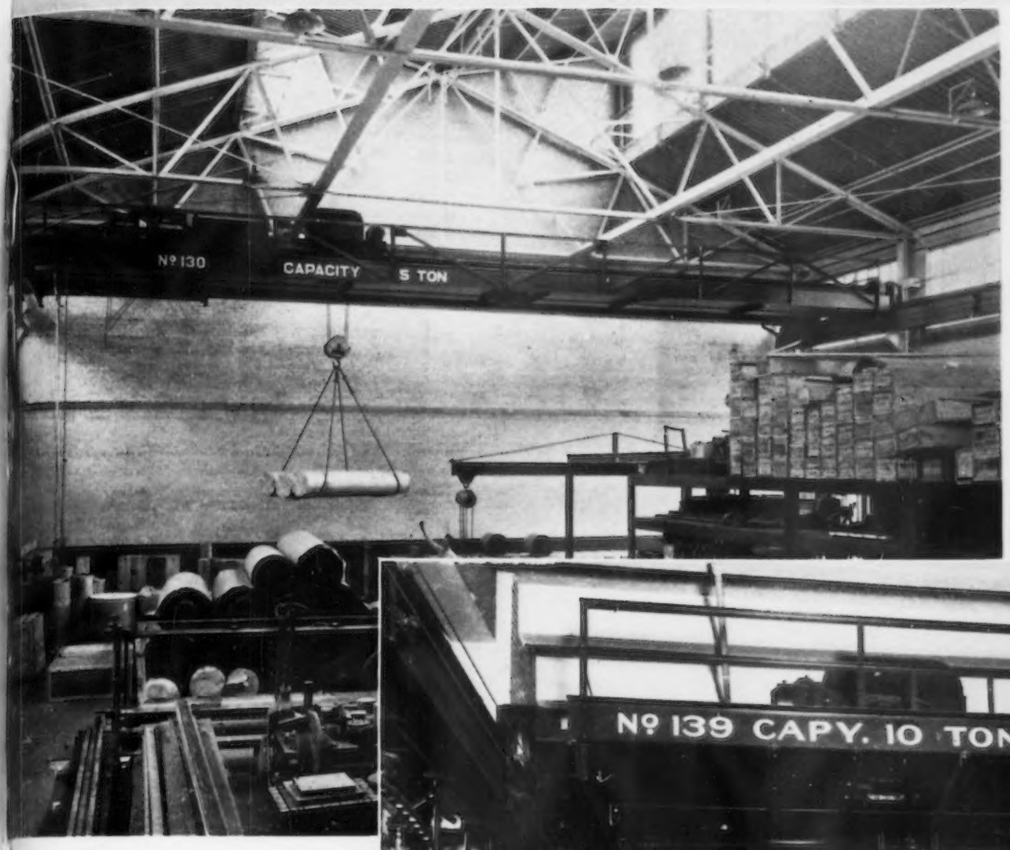
Consult your 'phone directory under Cleveland Tramrail.

CLEVELAND All Types for Every Industry CRANES

CLEVELAND TRAMRAIL

DIVISION OF
THE CLEVELAND CRANE & ENGINEERING CO.
WICKLIFFE OHIO

Dependable Shop Transportation –



Whiting Tiger Electric Traveling Crane, Capacity 5 tons. Floor control.



Whiting Tiger Electric Traveling Crane, Capacity 10 tons. Cage control.

with

Tiger

Electric Traveling Cranes

The Key to Low Costs

Points to look for in choosing your next crane:

- Roller bearings throughout.
- Herringbone gears.
- Oil-bath lubrication of gears.
- Completely enclosed gears.
- One-piece steel trolley frames.
- Taper tread drive wheels.
- Spring-set solenoid brake.
- Oil-flushed mechanical brake.
- Enclosed safety block.

These and many other refinements are embodied in the Tiger crane—***the key to low handling costs.***

At Westinghouse, as in hundreds of other manufacturing plants, Whiting electric traveling "Tiger" cranes are commended for low operating and maintenance costs. And that, after all, determines the real cost of any crane.

The reason for the Tiger's performance lies in the way it is designed and made. It is the original crane with herringbone-geared speed-reducer drives. The smooth rolling action of the herringbone gears, operating in oil bath, together with the use of roller bearings throughout, makes an easy-running crane that requires the very minimum of maintenance and repair. Back of the Tiger crane is an organization with a half century of successful manufacturing experience.

Send now for the complete story of the Tiger crane, telling how it is saving money for hundreds of manufacturers.

Ask for new Bulletin No. 300

WHITING CORPORATION
15601 Lathrop Ave., Harvey, Ill.

WHITING

PIONEERS SINCE 1884

a. C. f.

BERWICK ELECTRIC FORGING HEATER

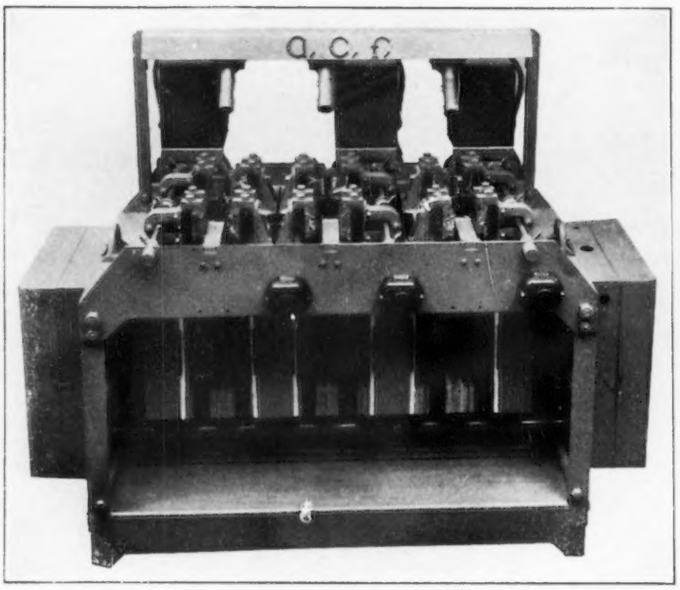
equipped with **Electric Eye** to control the temperature, thereby preventing either overheating or underheating.

Scale Does Not Develop during the process of heating by the resistance method, when heated quickly, thereby doubling your die-life, and reducing scale marks on finished material. General Motors has seven of these heaters installed in their plants for the making of drag links for their various types of automobiles.

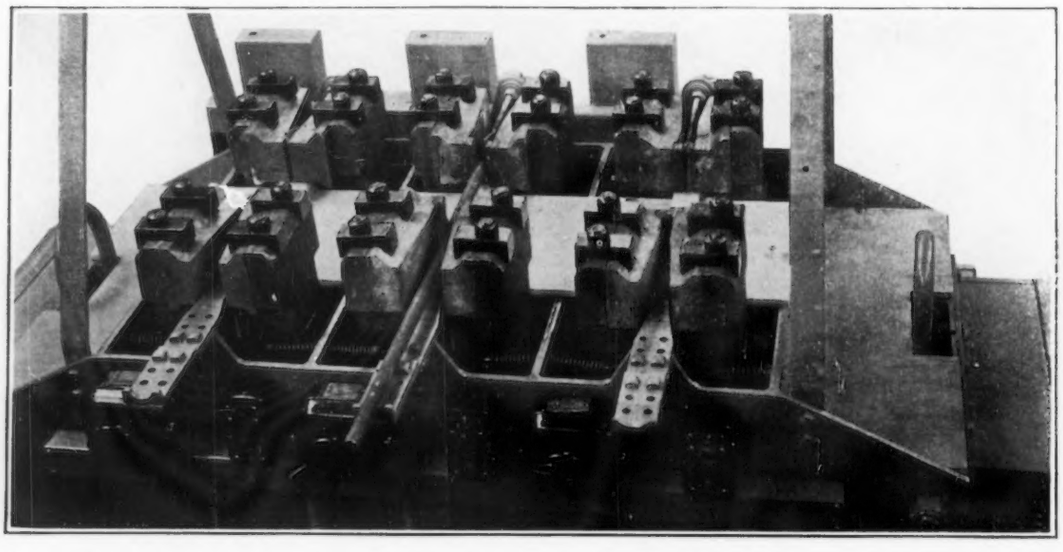
Capacity, from 5/16″ to 2½″ in diameter; length of heat, from 1″ to 24″, on the end or at any point, on any type bar or flat.

Protect Your Special Alloy Steel with the Electric Eye; accurately reproduces the temperature for which it is set.

Write us for details



(Front and top view)
No. 4 three-electrode A. C. F. Berwick Type "L" Forging Heater with Electric Eye, to control temperature



Showing top view of above heater. Note movable electrode blocks—adjustable to give from 1 to 24" heat.

AMERICAN CAR AND FOUNDRY COMPANY

30 CHURCH STREET ❖ ❖ NEW YORK, N. Y.

CHICAGO DETROIT ST. LOUIS

To Westinghouse Electric and Manufacturing Co.

Many Happy Returns!



Westinghouse locomotive equipped with 100-cell Exide-Ironclad Battery

WESTINGHOUSE PLANTS AND PRODUCTS HAVE LONG USED EXIDE BATTERIES . . .

THE Electric Storage Battery Company—itself 48 years old—has supplied batteries for years to the Westinghouse Electric and Manufacturing Company. Many of the electric industrial trucks and locomotives used in the Westinghouse plants are powered with Exide-Ironclad Batteries.

In addition, a number of Westinghouse products have Exide Batteries as original equipment This includes Westinghouse storage battery locomotives, many of which are delivered to purchasers with Exide-Ironclad Batteries; and Diesel-electric locomotives, which are equipped with Exide control batteries.



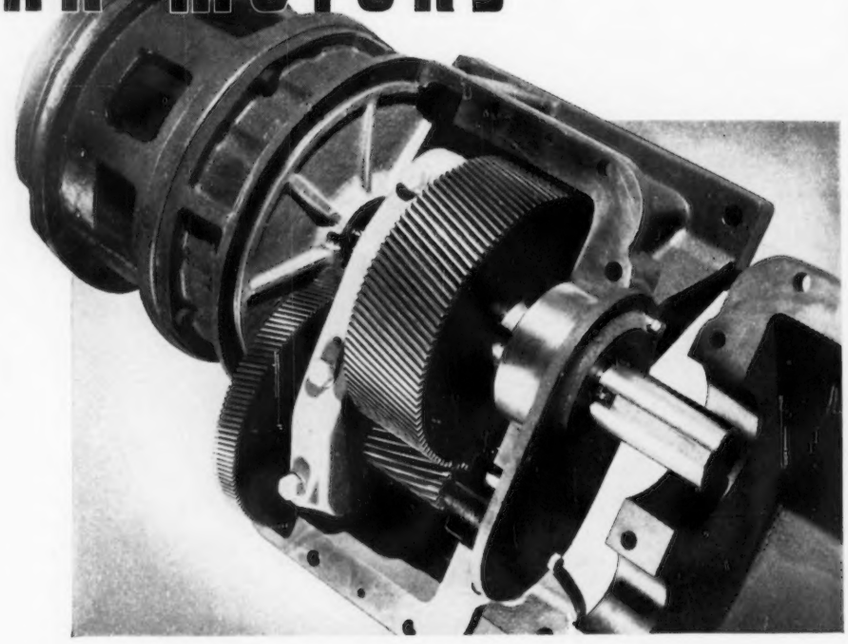
With nearly half a century of battery-building experience behind them, Exide-Ironclad Batteries have won an enviable position in the nation's industries. In powering material handling trucks, Exide-Ironclads have demonstrated their great reserve power, sustained voltage, low maintenance cost and long life. Write for free booklet, "The Efficient, Economical Method of Handling Material."

THE ELECTRIC STORAGE BATTERY CO., Phila.
The World's Largest Manufacturers of Storage Batteries for Every Purpose
Exide Batteries of Canada, Limited, Toronto

Exide
IRONCLAD
BATTERIES
WITH EXIDE **MIPOR** SEPARATORS
"MIPOR," Reg. U. S. Pat. Off.

Showing the construction of an Exide-Ironclad cell. Slotted rubber tubes retain the active material of the positive plates; separators are of Exide Mipor, the permanent storage battery plate insulator; cell jars are of Giant Compound, practically indestructible in normal service.

"PERFECT" OIL RETAINERS PROTECT WESTINGHOUSE GEAR MOTORS

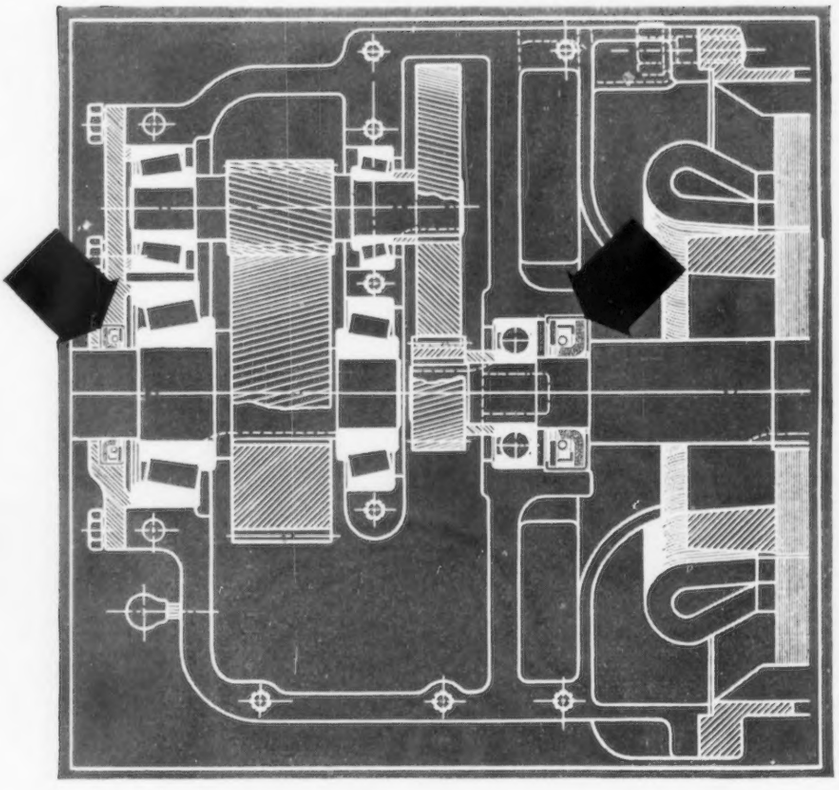


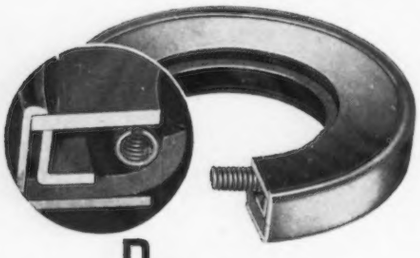
THE wide acceptance of the Westinghouse Gear Motor for materials handling and production equipment drives is due in no small degree to its reputation for dependability and long service life.

The use of Chicago Rawhide "Perfect" Oil Retainers on both high and low speed shafts, effectively holds the lubricant in the gear case. They protect both bearings and gears by preventing loss of lubricant and by exclusion of moisture, dirt or other foreign matter.

The centerless ground outside diameter of the "Perfect" Oil Retainer assures a precision fit in the bearing housing. The pre-softened and oiled shaft contact surface of the leather packing member reduces frictional resistance to a minimum.

Write for suggestions on the application of these bearing seals to your equipment.





PERFECT
Oil Retainer
PATENTED

CHICAGO RAWHIDE MANUFACTURING COMPANY

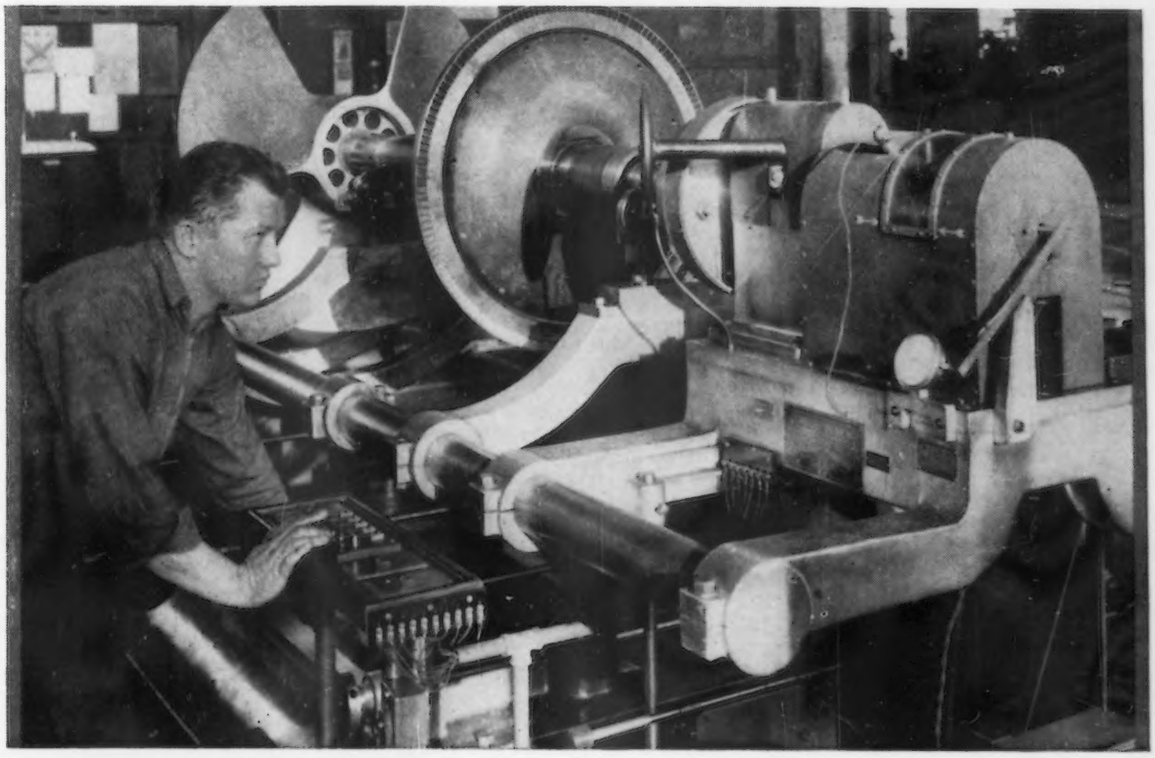
1306 ELSTON AVENUE • CHICAGO, ILLINOIS

57 Years Manufacturing Quality Mechanical Leather Goods Exclusively

PHILADELPHIA CLEVELAND NEW YORK DETROIT BOSTON PITTSBURGH CINCINNATI

Accuracy at **WESTINGHOUSE**

demands relentless inspection and testing





THE Tinius Olsen Testing Machine Company is happy to have supplied some of the equipment which enables Westinghouse to maintain high standards of manufacture and performance.

Illustrated on this page is an Olsen-Lundgren Style S Static-Dynamic Balancing Machine used by Westinghouse for balancing the rotation element of propeller type blowers to insure perfect running.

Also an Olsen Universal Testing Machine for testing specimens of steel, brass and copper to see if they meet the Westinghouse specifications. This machine is also used for testing Micarta in compression and shear.

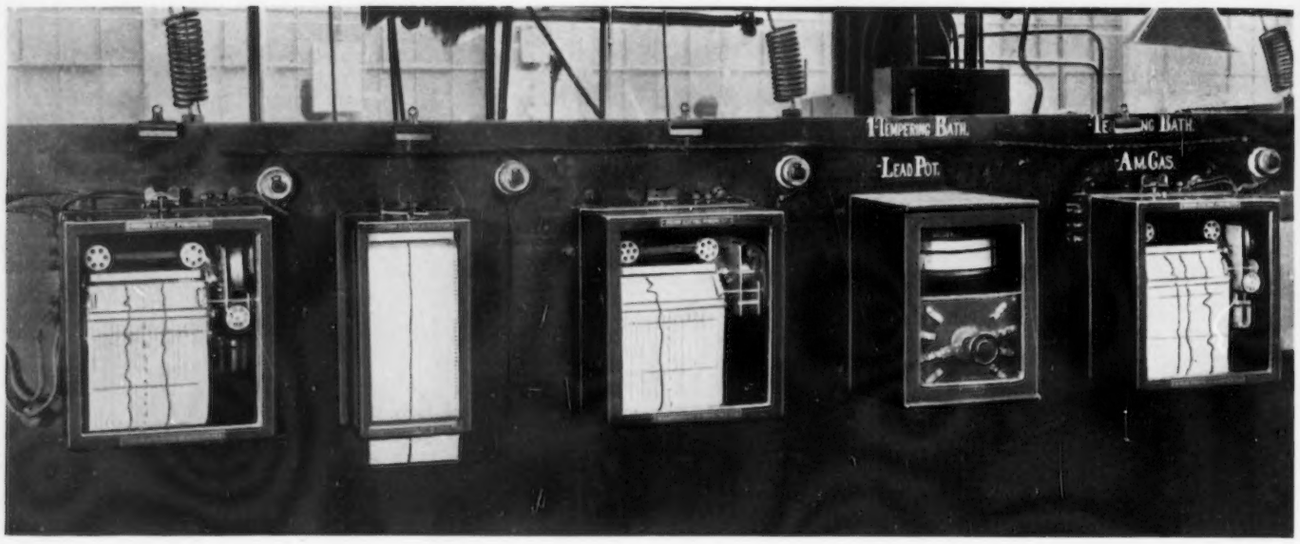
We join with the entire industry in extending best wishes to the Westinghouse Electric & Manufacturing Company upon the conclusion of its 50th year of outstanding service.

TINIUS OLSEN TESTING MACHINE COMPANY

500 N. 12TH ST. **PHILADELPHIA, PA.**

Keeping Pace With Progress

AT WESTINGHOUSE ELECTRIC and MANUFACTURING CO.



Panel board of Brown Pyrometers installed in heat treating department of Westinghouse "Lester Works" at Philadelphia. Shows (second from left) one of the earliest Brown Pyrometers that has been in continuous operation since 1921.

TWENTY-FOUR years separate the first and the latest installation of Brown Pyrometers.

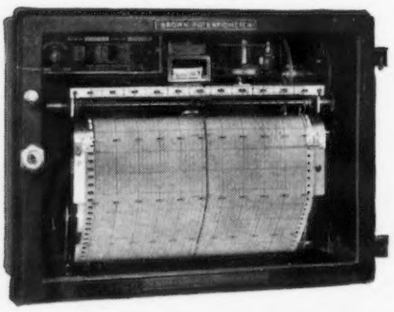
In the manufacture of Westinghouse products where temperature is a vital factor in producing quality—we are proud of the part entrusted to Brown Millivoltmeters and Potentiometer Pyrometers in metallurgical, ceramic and other processes.

The part that Brown Pyrometers can play in reducing costs and increasing efficiency in your plant is the logical result of over 75 years of precision manufacture and experience in the application of Indicating, Recording and Controlling instruments.

In the heat treatment of metals, Brown Potentiometer Pyrometers make possible an accuracy of 1/5 of 1% in temperature measurement and control. This accuracy is your guarantee that quality can be standardized and costs reduced by simplifying heat treating processes and elimination of re-treatments.

Brown Pyrometers and Minneapolis-Honeywell Controls are applicable for any temperature measurement and control problem regardless of size or complexity—for any type furnace.

Write for catalogs and information. The Brown Instrument Company, a division of the Minneapolis-Honeywell Regulator Company, 4483 Wayne Avenue, Philadelphia, Pa. Offices in all principal cities. Canadian Factory, 117 Peter Street, Toronto, Canada. European Address: Minneapolis-Honeywell Co., Wijdesteeg 4, Amsterdam—C.

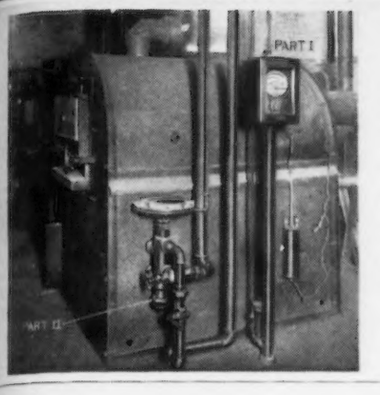


Brown Potentiometer Pyrometers can be supplied as electric or air operated controllers.

BROWN POTENTIOMETER PYROMETER
AND
MINNEAPOLIS-HONEYWELL CONTROL SYSTEMS

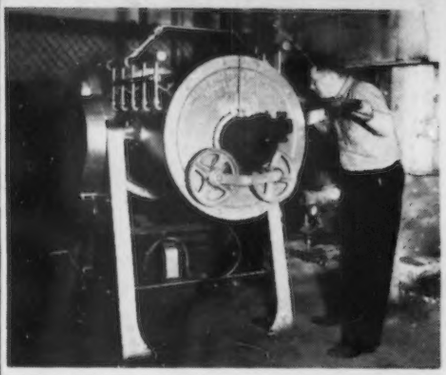
To Measure and Control is to Economize

PIONEERS IN 1878 — LEADERS TODAY

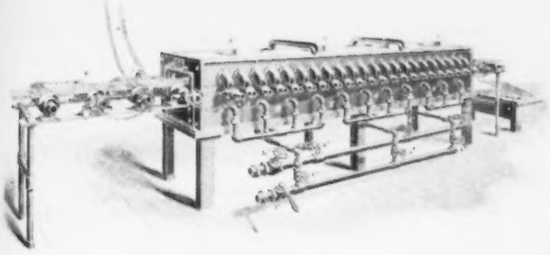


1st Automatic Temperature Control 1910

Note Modernistic Streamlining of This Furnace Built Before 1910

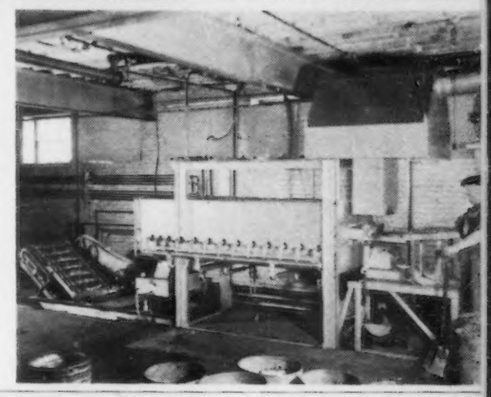


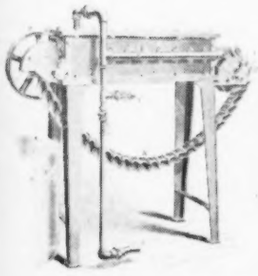
Rotary Carburizing Nitriding and Bright Annealing at *WESTINGHOUSE



1st Roller Hearth Heating Machine 1899

Continuous Heat Treating with Atmosphere Control



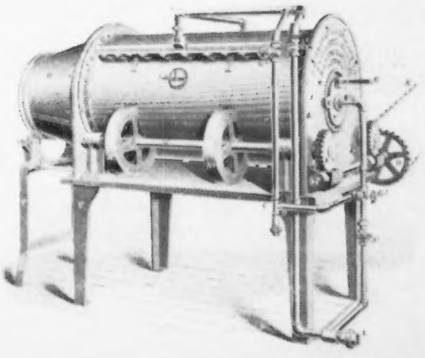


1st Chain Conveyor Heating Machine 1899

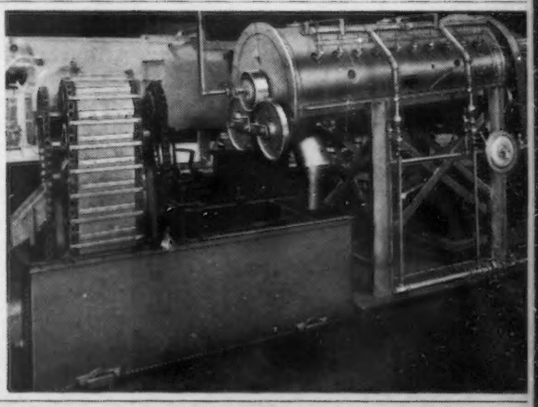


Vertical Retort Gas Carburizing

1st Rotary Retort Heating Machine with Atmosphere Control 1902



Continuous Gas Carburizing



Write for latest information on our new developments

*Westinghouse also has many other types of our equipment

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Elizabeth, New Jersey

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Acetic Acid Commercial
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Alum—Filter
Alum—Paper Makers
Alum—Pearl
Alum—Potash U.S.P.
Aluminum Sulphate
Commercial and Iron Free
Aluminum Chloride Crystals
Aluminum Chloride Solution
Ammonium Nitrate
Ammonium Nitrate, C. P.
Ammonium Sulphate 99.5%
Aqua Ammonia
Aqua Fortis
Arsenic Acid
Barium Carbonate
Barium Chloride
Barium Sulphate—(Blanc Fixe)
Battery Acid
Battery Coppers
Battery Zinc
Bi-Chromate of Soda
Bi-Chromate of Potash
Bi-Sulphate of Soda
Bi-Sulphite of Soda Solution
Bright Zinc
C. P. Ammonium Hydroxide
C. P. Glacial Acetic Acid
C. P. Hydrochloric Acid
C. P. Nitric Acid
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Inhibitor No. 8—Foaming
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Lactic Acid, Edible
Lactic Acid, U.S.P.
Manganese Nitrate
Mixed Acid
Mossy Zinc
Muriate of Tin Crystals
Muriate of Tin Solution
Muriatic Acid
Nitric Acid Commercial
Nitric Acid Engraver's Grade
Nitric Acid Fuming
Nogas
Oleum
Oxalic Acid
Phosphate of Soda
Phosphate of Soda—Anhydrous
Phosphate of Soda—Mono
Potassium Silicate Glass
Potassium Silicate Solution
Sal Ammoniac
Salt Cake
Sherardizing Zinc
Silicate of Soda—Anhydrous
Silicate of Soda Granulated
Silicate of Soda G.4.S.
Silicate of Soda Lump
Silicate of Soda Meta
Silicate of Soda Pulverized
Silicate of Soda "R-B"
Silicate of Soda Solid Glass
Silicate of Soda Solution
Snowflake Soldering Salts
Sodium Pyrophosphate
Sodium Formate
Sodium—Lead Alloy
Sodium—Zinc Alloy
Sodium Silico Fluoride
Soldering Flux Crystals
Soldering Flux Solution
Slab Zinc
Strontium Carbonate
Strontium Nitrate
Sulphate of Soda Anhydrous
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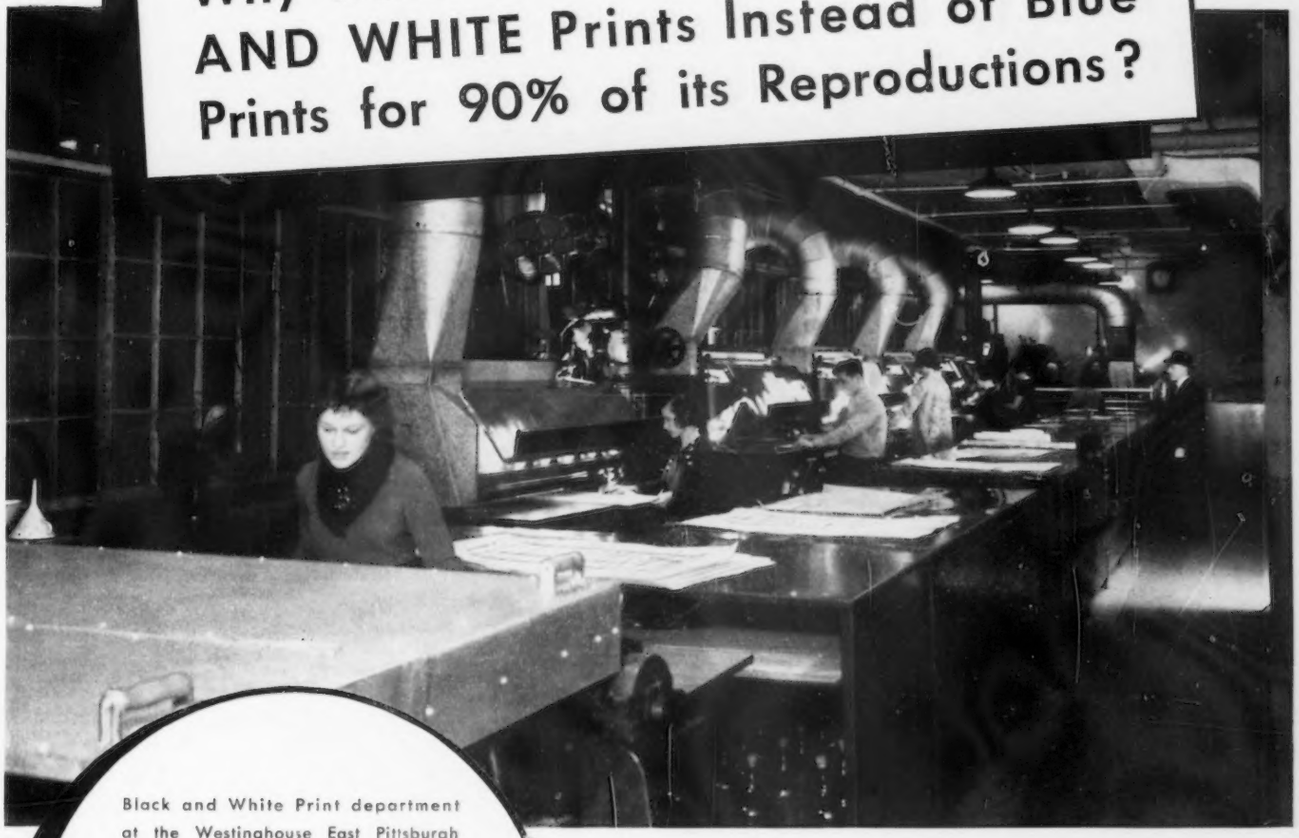
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Why Does Westinghouse Use BLACK AND WHITE Prints Instead of Blue Prints for 90% of its Reproductions?



Black and White Print department at the Westinghouse East Pittsburgh Plant. Notice that the five blue print machines that expose the paper have no washing or drying attachments—none are needed for BW Prints. Also, no trimming shears are needed—no paste cans—for BW paper is available in sheets cut to your tracing sizes, although you may have BW Paper in rolls, if you prefer.

NINETY per cent of the prints made by Westinghouse at its huge East Pittsburgh plant are BLACK AND WHITE Prints. Paper exposed with the tracings in blue print machines is introduced into two 80-inch BW Developing Machines. At one end of each of these developing machines, a girl feeds the exposed paper. At the other side of the machine, a girl stacks up the fully developed BW Prints. It takes only 50 seconds to expose and develop a 24" x 36" print! There's no washing or drying, of course.

Like hundreds of other BW users, Westinghouse has found BW Prints—black lines on white backgrounds—far more useful than blue prints. BW Prints are made *directly* from the tracing, without the use of a negative. The BW Process is the most simple, safe and satisfactory process of its kind on the market. BW Developing Machines fit every need, from the smallest to the largest. Write for our FREE booklet, "Prints for Today." It tells the whole story of BW economy and usefulness.

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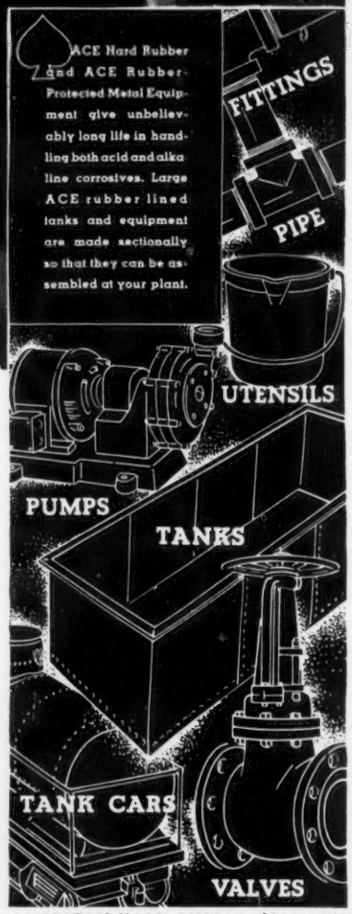
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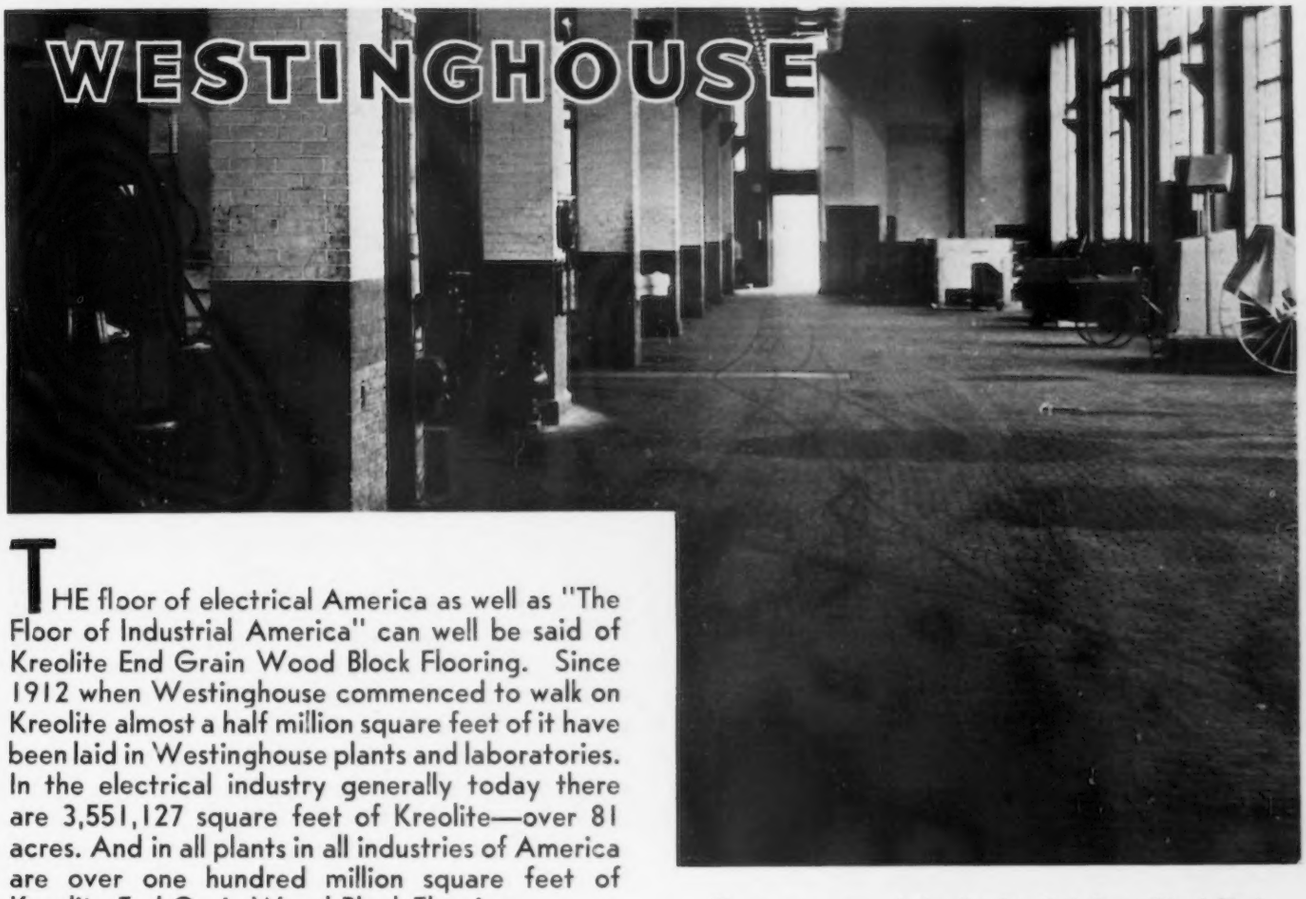
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KREOLITE

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THE floor of electrical America as well as "The Floor of Industrial America" can well be said of Kreolite End Grain Wood Block Flooring. Since 1912 when Westinghouse commenced to walk on Kreolite almost a half million square feet of it have been laid in Westinghouse plants and laboratories. In the electrical industry generally today there are 3,551,127 square feet of Kreolite—over 81 acres. And in all plants in all industries of America are over one hundred million square feet of Kreolite End Grain Wood Block Flooring.

These statistics are interesting to any executive who is seeking an economical, wholly satisfactory, permanent solution of the flooring problem. Kreolite outlasts the factory. It is clean, quiet, resilient, and provides limitless durability. It is easy on feet, and tools which may be dropped suffer no damage. It supports the heaviest loads, offers limitless resistance to the grinding impact of heavy trucking, and at the same time provides ease and comfort for those who work upon it.

Showing a section of the Kreolite End Grain Wood Block Floor in the Westinghouse Central Engineering Building in Pittsburgh. This floor was submerged for 12 hours without appreciable damage during the flood in March.

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Whatever may be your flooring requirement, for new buildings or new floors in old buildings, you can find what you want in Kreolite. Make sure of satisfaction. Specify Kreolite. Insist on Kreolite. The Jennison-Wright Company, Toledo, Ohio, U. S. A. Branches In All Principal Cities.

FLOORS

WOOD BLOCK

The 'HOT WEATHER' Headband!

During the hot summer months in working conditions, such as are encountered in—Steel Mills, Foundries, Oil Refineries, Boiler Works, Locomotive Shops and Acid Plants where workers are continually confronted with conditions of extreme heat, moisture, steam, perspiration, oil, grease and acids, Drednaut Non-Rubber Headbands are particularly effective.



Drednaut Non-Rubber Headband

The Drednaut Non-Rubber Headband is NOT affected by any of the conditions named above because it contains no rubber. Its construction, which consists of a section of non-corrosive bead chain, over which is placed a section of spring, and which is enclosed in a cloth sleeve, makes it especially ideal for use in hot weather where the ordinary elastic headbands cause no end of trouble and grief from perspiration.

The Drednaut Non-Rubber Headband is adjustable to any size head. Once adjusted—it stays adjusted for keeps, and maintains a uniform tension indefinitely. Men are amazed at its comfort and fool-proof qualities, and what's more, it makes them LIKE to wear goggles.



Super-Drednaut 50-S Goggles

If your men are confronted with any of the conditions mentioned above—have them try a pair of Drednaut or Super-Drednaut Goggles with the Non-Rubber Headband—they will be amazed with its everlasting comfort and non-existent annoyances so prevalent in the old style elastic headbands.

Send for Complete General Catalog No. 10

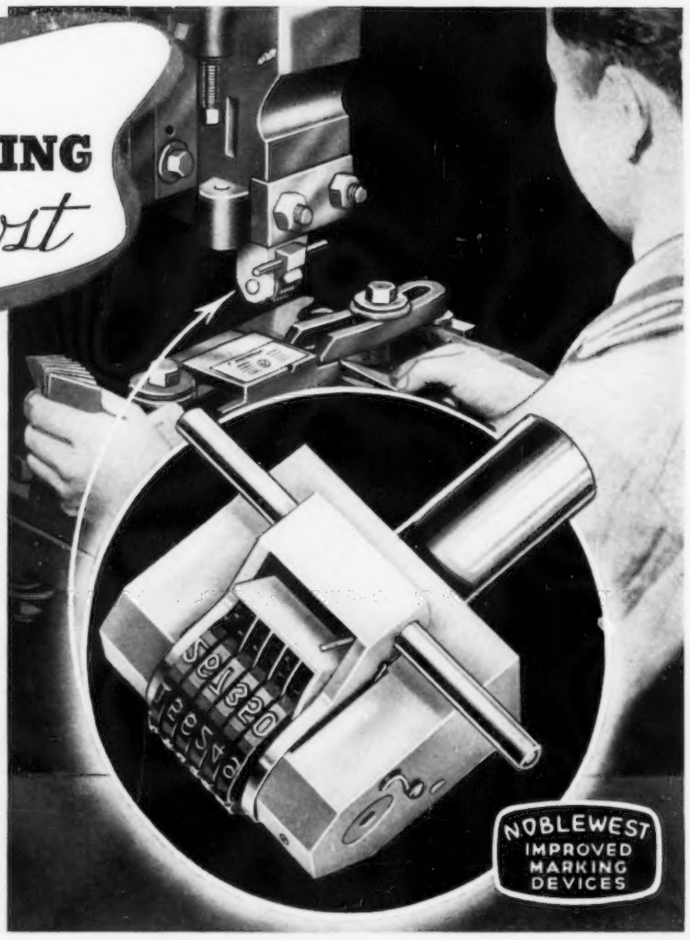
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Protect your profits when chips begin to fly

When men work without goggles where the slightest eye hazards exist, their eyes are a constant threat to operating costs . . . and company profits. For eyes are expensive targets . . . a single serious eye injury in your plant can quickly mount to more than $2000 in lost time, medical and hospital expenses, settlements and increased insurance rates.

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Plan to go through 1936 without a single eye injury. American Optical Company can help you do so . . . with a complete line of eye protection equipment for every known eye hazard. Trained industrial eye safety men are available from a branch office located near you to help put a practical eye safety program into effect in your plant. Get in touch with *your* branch office or write American Optical Company, Southbridge, Mass.

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The AO Duralite-"50" is light, cool, comfortable. Its fuss-proof bridge provides easy, permanent adjustment to any face. Super Armorplate lenses provide maximum protection from impact.



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Facts Unseen

This institution has been associated in a business way with the Westinghouse interests for a long enough time, and at short enough range, to venture an observation or two which Westinghouse cannot say for itself with propriety.

The civilized world has set its seal of approval on the things which Westinghouse makes, but back of the perfection which the name implies stand the *unseen* values which contribute to that perfection.

We speak specifically of the unimpeachable business morality in which its broad policies are saturated.

Of the courage to venture into the realm of new ideas, patient for reward until use and experience have proved their practical worth.

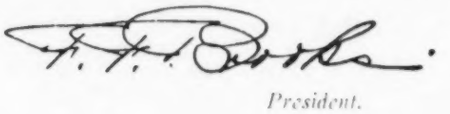
Of its high sense of civic responsibility, both to its workers and to the communities in which these workers live.

Of its vision and belief in America, by sailing a true course during the uncertain recent years.

These things are mentioned, not because they are peculiar or exclusive to Westinghouse, but because they are symbolic of a very great number of large American corporations.

They should be more generally understood by the rank and file of the American people.

FIRST NATIONAL BANK AT PITTSBURGH, PA.



President.



The Iron Age extends . . .

heartiest congratulations to Westinghouse on the occasion of its Golden Jubilee. It may look back with satisfaction on its 50-year record of accomplishment. Great indeed has been its contribution to industrial progress and to the comfort and well-being of the individual. » The successful development of great enterprises is inevitably linked with the development and progressiveness of the industry of which it is a part. Westinghouse, we are sure, would be the last to claim that it could have attained its present position single-handed, independent of the metal-working industry as a whole. » So congratulations are also due to this great industry which it has been the privilege of The Iron Age to serve for over 80 years. What any unit achieves is a reflection of the collective attainment in developing and making available constantly improved materials, processes, machines and equipment.



Nature In The Raw

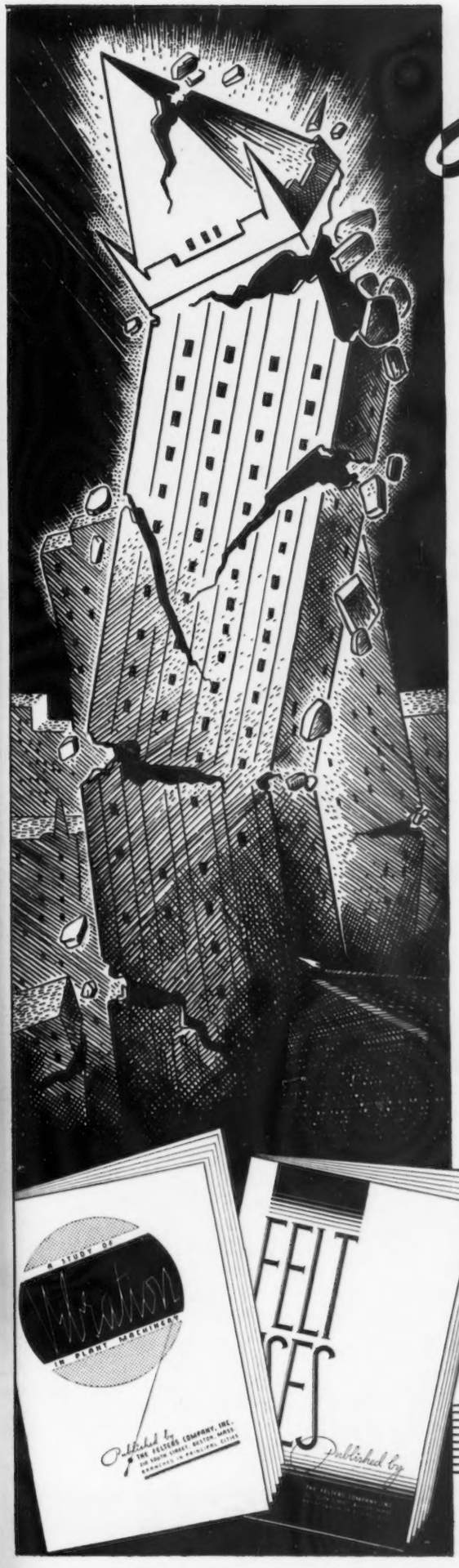


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. . . which is another way of saying, "Harrisburg makes its own steel." And, without doubt, this is a logical and practical way of guaranteeing quality at the source of manufacture. . . . But—Harrisburg does more than this. From the very beginning, each Harrisburg product is a result of complete coordination of the engineering, metallurgical and production facilities. Thus, every operation is Harrisburg-controlled, assuring the high quality which for many years has been a "Standard of Comparison." Harrisburg products: Carbon and Alloy Steels, Drop and Hollow Forgings, Pipe Flanges, Couplings, Bull Plugs, Pump Liners, Cylinders, Coils, Bends. : : Harrisburg, Pa.





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Sheared
STEEL PLATE
FLANGED AND DISHED HEADS
BLUE ANNEALED SHEETS

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Round One is no test!

And so it is with rolled steel plate. Inferior quality plate may make the grade for the "first round"—but there is no substitute for the *best* where time is the test.

For three generations, WORTH have made Sheared Steel Plate of uniform quality and dependability . . . *assured by complete control of manufacture from ingot to finished plate.* WORTH quality and merit is recognized, tested and proven; for reliable plate and best service, specify "WORTH" on your next order.

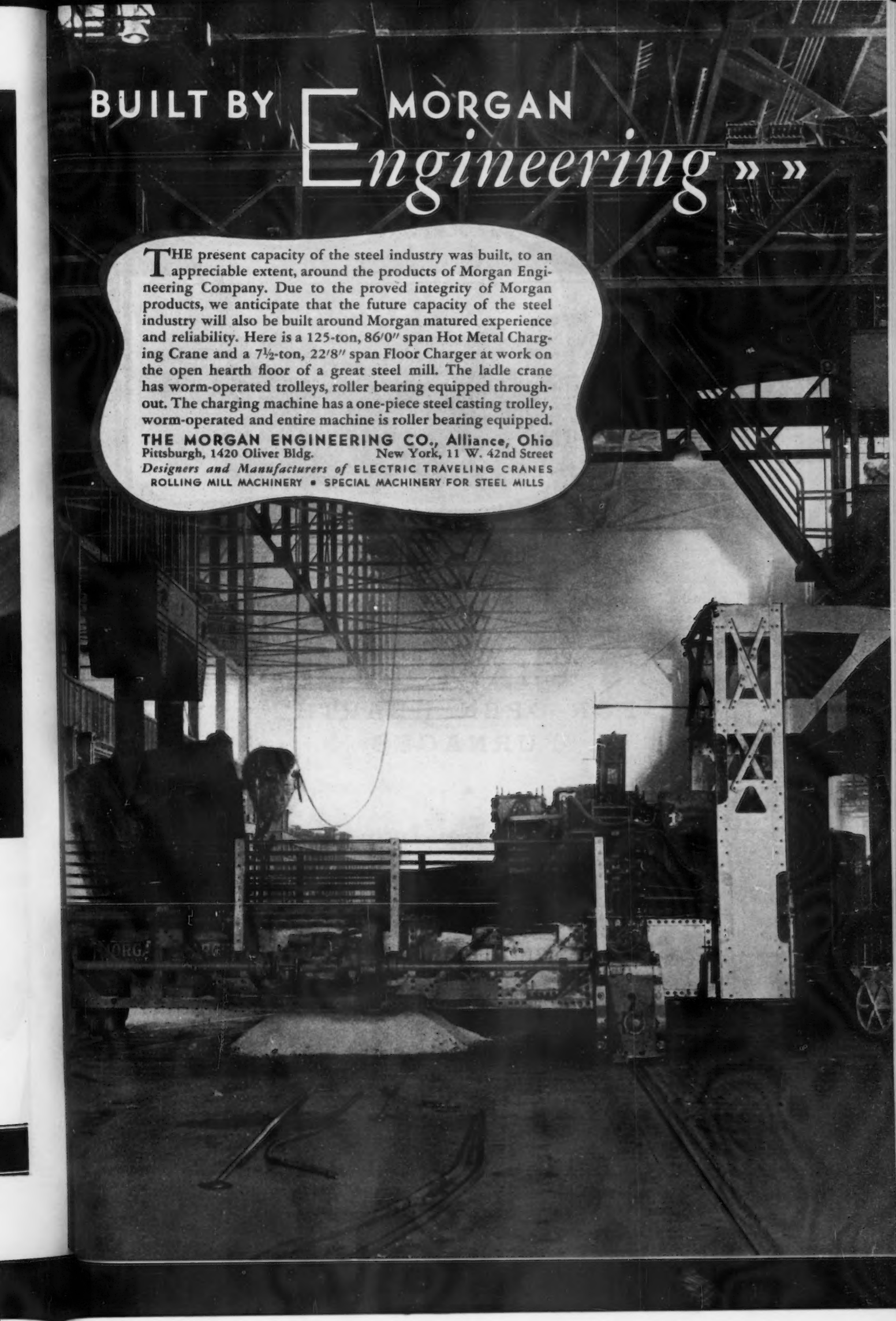
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Sheared Steel Plates up to 150" wide.

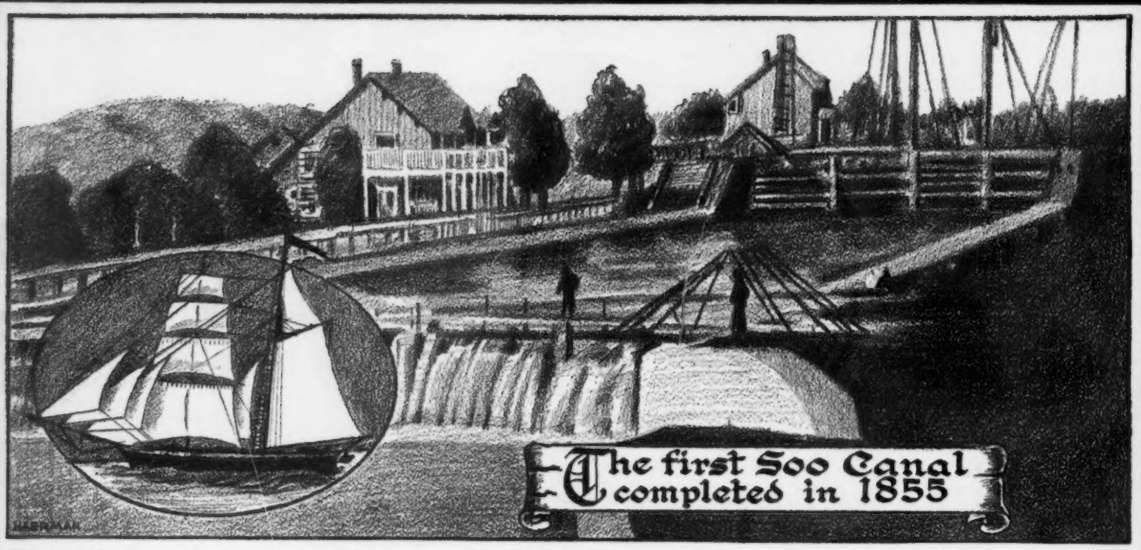
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Blue Annealed Sheets in all gauges down to No. 16 and widths up to 60". Greater widths on application.

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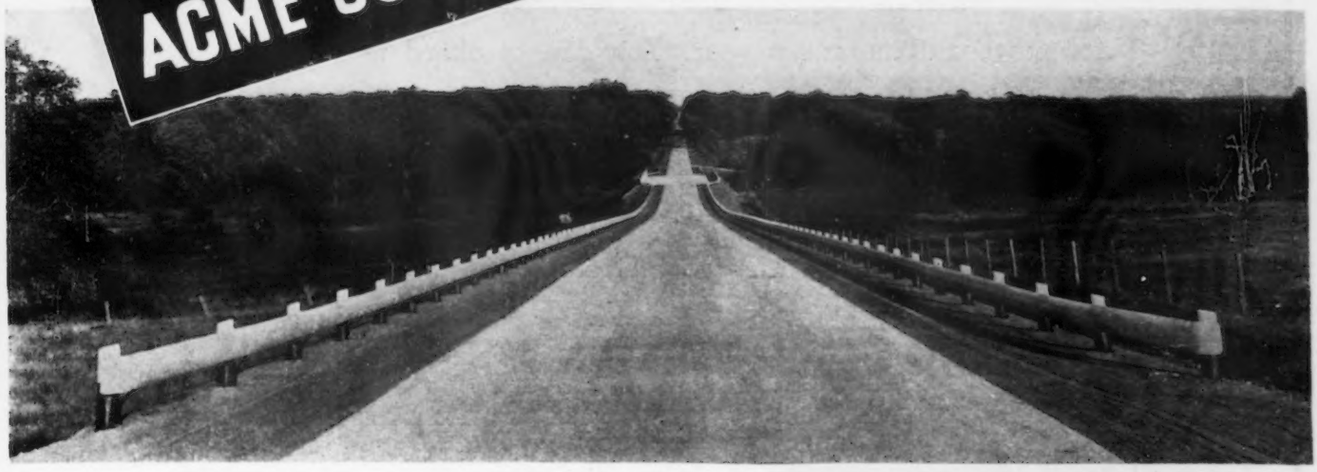
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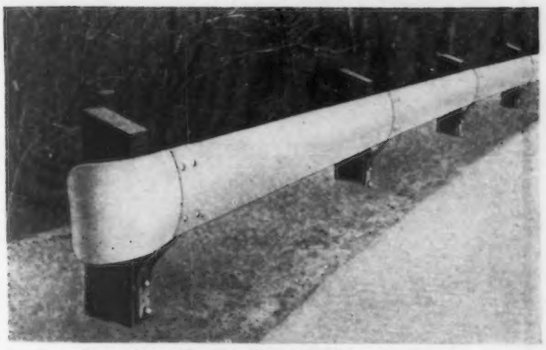
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Front View Convex Guard Rail and end piece.



Showing Highway Guard on curved road.

Photographs courtesy Tuthill Spring Co., Chicago. Ill.

Acme Superstrip

HOT ROLLED • COLD ROLLED — The ACME of STRIP STEELS — GALVANIZED • STAINLESS

ACME STEEL COMPANY, 2825 Archer Ave., Chicago
Send me a copy of the booklet "Batting 'Em Out."

Name .....

Firm .....

Street .....

City ..... *State* .....

100% Increase

IN SPACE RESERVATIONS OVER 1935

$200,000,000 Market for Steel Equipment . . .

That is exactly how much money is being spent by the Steel Industry for new equipment this year. You cannot afford to overlook an opportunity like the coming IRON AND STEEL EXPOSITION in Detroit, Michigan, for cultivating and further developing your sales work in the great Steel Industry.

Meet the Key Officials . .

Here at the IRON AND STEEL EXPOSITION will be assembled the executives and operating officials of the industry who are selecting the new equipment for their plants. Meet these men during the four day period of the show and point out to them just how your equipment and services will help them.

Additional Space Available . . .

Even though the space demand for this Exposition has been overwhelming, plans have been made to care for all those who wish to exhibit. Additional space has been secured and complete information may be obtained by addressing the IRON AND STEEL EXPOSITION, 1010 EMPIRE BUILDING, PITTSBURGH, PENNA.

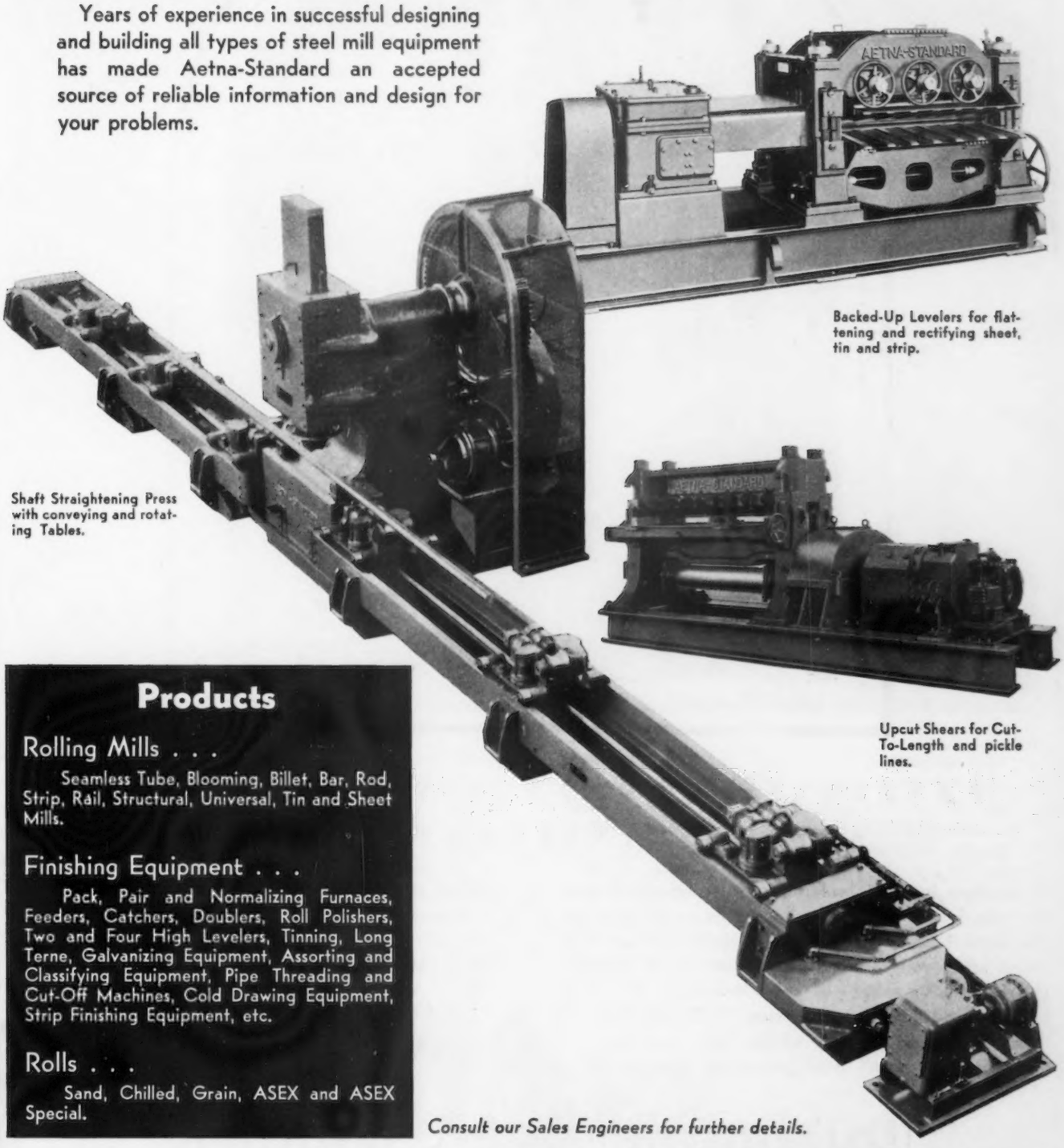
IRON AND STEEL EXPOSITION

« « « « SEPTEMBER 22, 23, 24, 25 » » » »

DETROIT • • • • MICHIGAN

AETNA-STANDARD Modern Equipment Means Increased Profits

Years of experience in successful designing and building all types of steel mill equipment has made Aetna-Standard an accepted source of reliable information and design for your problems.



Backed-Up Levelers for flattening and rectifying sheet, tin and strip.

Shaft Straightening Press with conveying and rotating Tables.

Upcut Shears for Cut-To-Length and pickle lines.

Products

Rolling Mills . . .

Seamless Tube, Blooming, Billet, Bar, Rod, Strip, Rail, Structural, Universal, Tin and Sheet Mills.

Finishing Equipment . . .

Pack, Pair and Normalizing Furnaces, Feeders, Catchers, Doublers, Roll Polishers, Two and Four High Levelers, Tinning, Long Terne, Galvanizing Equipment, Assorting and Classifying Equipment, Pipe Threading and Cut-Off Machines, Cold Drawing Equipment, Strip Finishing Equipment, etc.

Rolls . . .

Sand, Chilled, Grain, ASEX and ASEX Special.

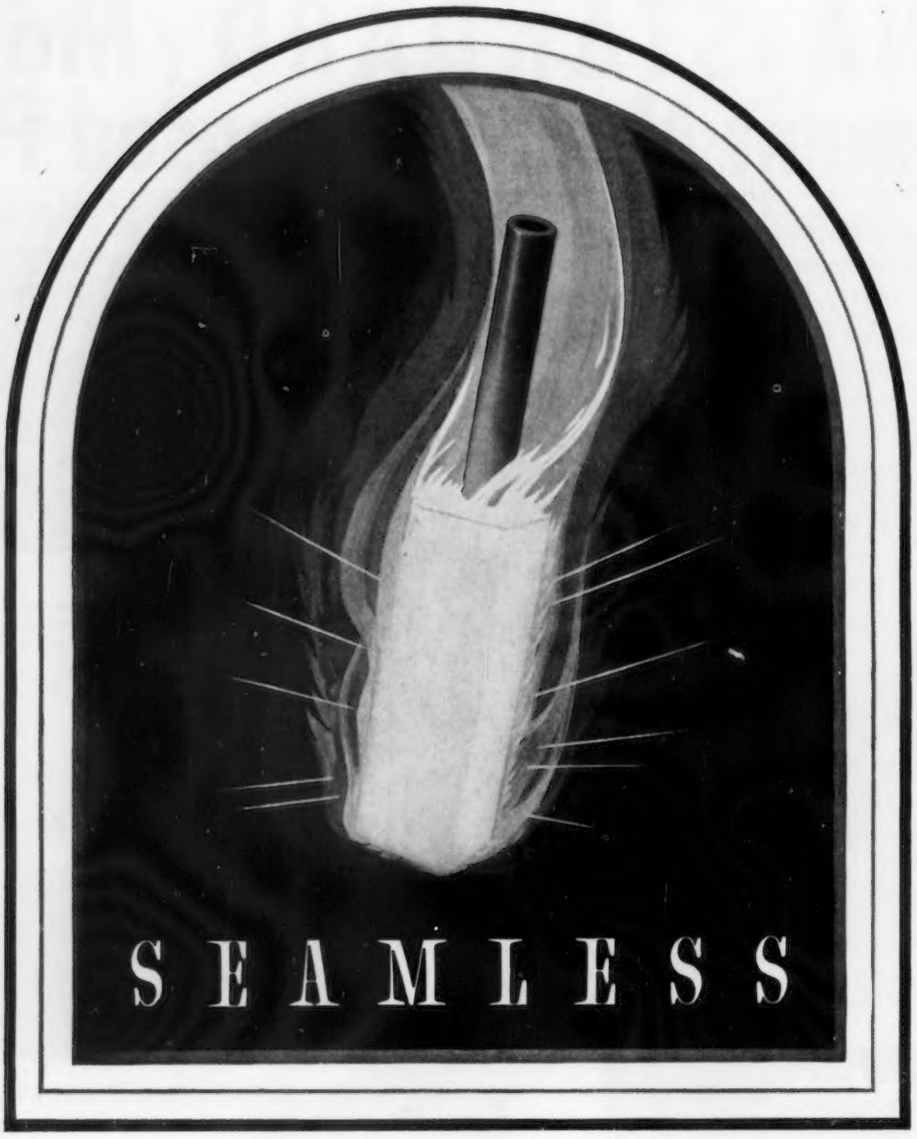
Consult our Sales Engineers for further details.

THE AETNA-STANDARD ENGINEERING COMPANY

CONSULTANTS • DESIGNERS • BUILDERS

STEEL AND NONFERROUS INDUSTRIES

YOUNGSTOWN « OHIO » U.S.A.



FASHIONED FROM A LIVING, GLOWING MASS OF INTEGRATED STEEL

At no time in the fabrication of a Pittsburgh Seamless tube is the continuous, homogeneous structure of the steel broken. Slowly and steadily the steel is rolled and wrought from a white-hot ingot through the successive stages of the blooming mill to the piercing and finishing operation. It is still the same solid piece of steel, of the same analysis, and with the same homogeneity of structure.

There are no seams, no points or zones of potential weakness. Pittsburgh Seamless, because of its great strength and dependability under all conditions, is ideal for high pressure piping.

PITTSBURGH STEEL COMPANY
PITTSBURGH, PA.
New York Detroit Chicago St. Louis Houston
Tulsa Los Angeles San Francisco

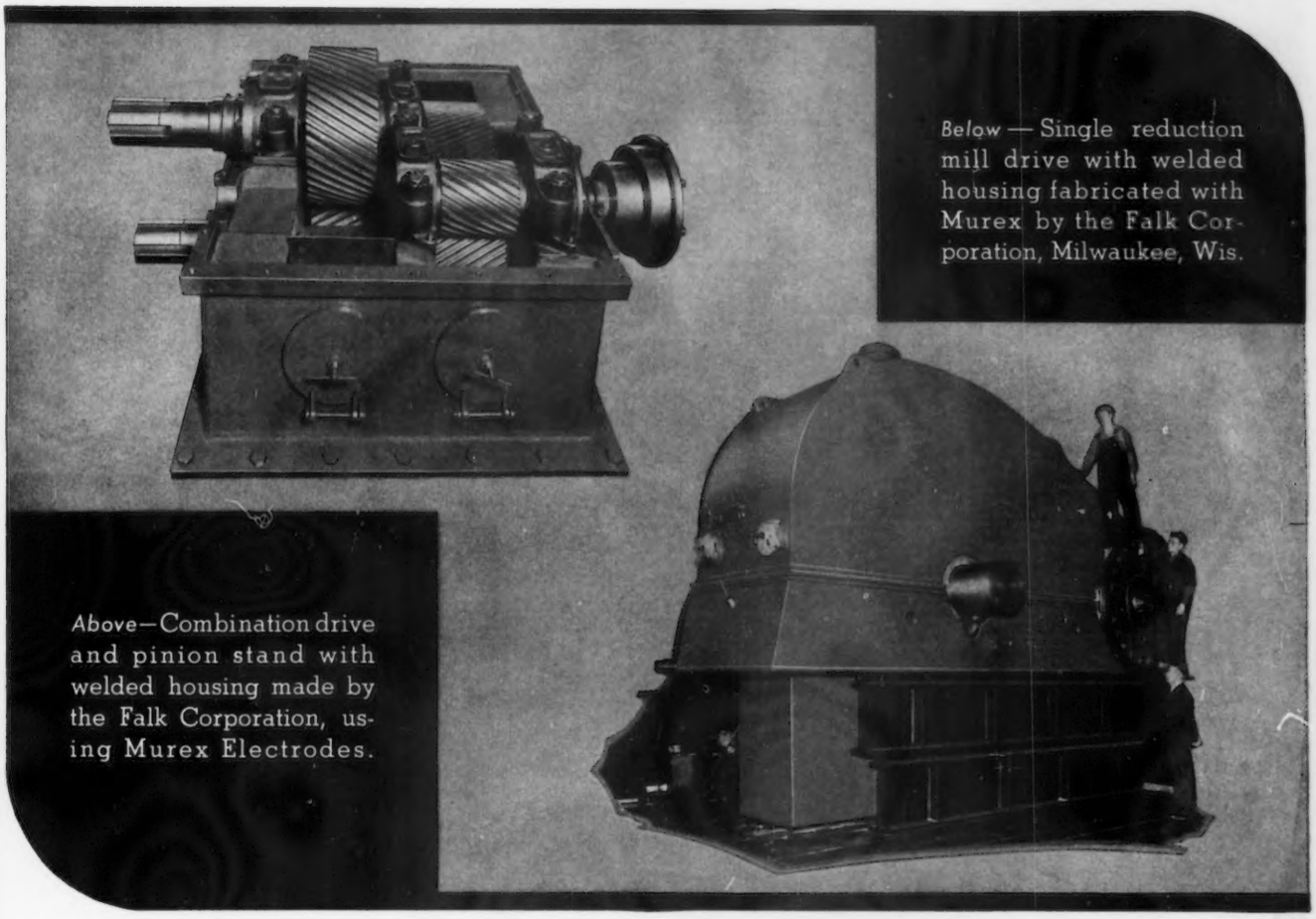
Pittsburgh Seamless

CRACKING STILL TUBES . . . HEAT EXCHANGER TUBES
CONDENSER TUBES . . . REFINERY PIPING

THERE IS NOTHING SUPERIOR TO SEAMLESS

Welding improves the product...

MUREX IMPROVES THE WELDING



Below — Single reduction mill drive with welded housing fabricated with Murex by the Falk Corporation, Milwaukee, Wis.

Above—Combination drive and pinion stand with welded housing made by the Falk Corporation, using Murex Electrodes.

Welding the housings of heavy gear drives provides strong, light, good-looking units. Fabrication of these housings by welding together rolled plates and steel castings also results in speedier production and economy of materials.

To make the most of these advantages of welding, manufacturers, not only of gear drives, but of machinery and equipment of every kind, are now using Murex Electrodes.

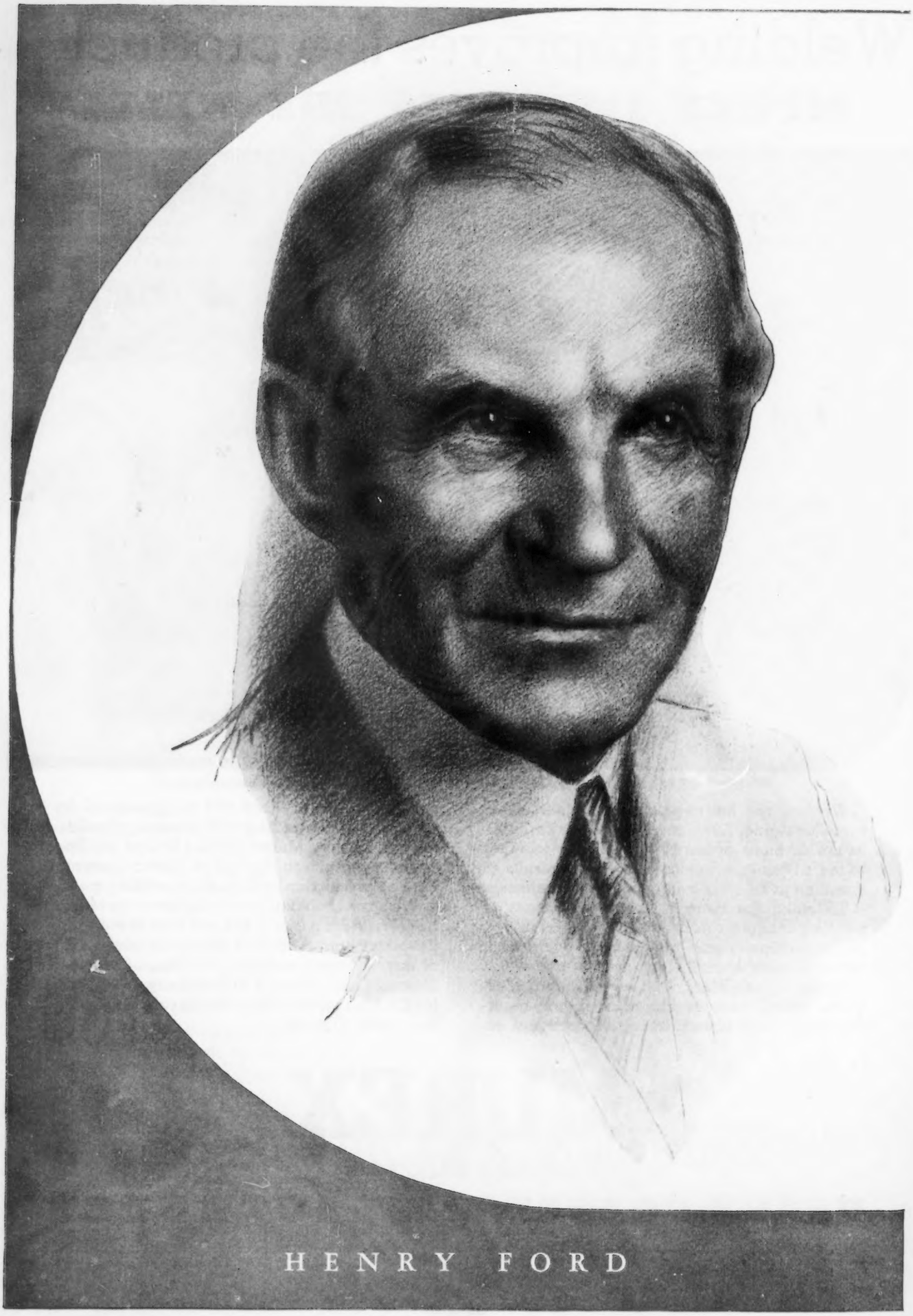
These Spiral-Wound, Heavy-Coated Electrodes contribute to structural strength by assuring consistently sound, dense deposits and superior weld metal. They add to appearance by providing the smoothest and cleanest of welds. And, the heavy Murex coating lowers welding costs by permitting the use of higher currents; steps up production by increasing welding speed.

We have a booklet describing the entire Murex line. Write for it today, and ask to have our engineers bring to your own problems the advantages of our 35 years welding experience. Metal & Thermit Corporation, 120 Broadway, New York, N. Y.; Albany, Chicago, Pittsburgh, South San Francisco, Toronto.

MUREX

Spiral Wound

HEAVY COATED ELECTRODES



HENRY FORD

Sixty thousand carry on !

Neither royal decree nor wealth nor luck can alone make leadership actual. It is not born—but earned! And because of this, untold thousands study the formula of vision, preparation, thought and toil which brought about its attainment.

Nowhere can there be found a clearer, surer record of upward progress than in the sphere of industry. There, today, leaders are adding new steps to the foundations of the past. A vision evolves into a discovery that changes the standards of life of a nation. Thought and toil mesh to produce a new machine or process that brings a former luxury within the reach and enjoyment of all.

Among the 60,000 executives who read The Iron Age are both leaders and understudies of every rank and degree. The fact that in The Iron Age they find information and inspiration is evidence of their determination to carry forward the traditions and principles which have made America great.

The Iron Age has for over 80 years been dedicated to the principle that industrial progress is a vital cornerstone in the life of our nation. Editorially it supplies its readers with essential news and information of all that is best in management, methods and processes. Supplementing its editorial pages are over five hundred regular advertisers who present the latest news of new equipment, materials and processes. To buyers and sellers alike The Iron Age is not only a great market place but an inspiration to progress and constructive leadership.

Advertising executives, interested in the metal working industry, are invited to send for a new booklet containing the facts about The Iron Age circulation and the field covered.



A Chilton Publication

THE IRON AGE



Pressure tight castings call for PURE CHARCOAL PIG IRON

VALVE bodies—hydraulic vessels—and pressure vessels—demand pressure tight castings.

The dense, close grain, uniform structure castings required in pressure vessels are readily obtainable with Pure Charcoal Pig Iron. 15% to 25% or more—in every charge, assures consistently good results—with lower percentage of loss in both foundry, machine shop and on test.

Pure Charcoal Pig Iron permits the higher superheats required for solution of the large graphite nuclei—a necessity in producing high strength castings. Slower cooling rate minimizes danger of incipient shrinkage cracks.

Sixteen grades of Pure Charcoal Pig Iron with a wide variety of properties, offer plenty of metallurgical choice.

Our Metallurgical Department will render prompt service to meet your particular needs.

Write—

SUPERIOR CHARCOAL IRON COMPANY
GRAND RAPIDS, MICHIGAN

DEBEVOISE-ANDERSON CO., INC., Eastern Representative
NEW YORK • BOSTON • PHILADELPHIA



After the first stamping job . . . They come back for more!

Many of our present customers first came to us when they wanted an unusual stamping that called for real experience and ingenuity in the making of it.

Here at Parish they found men accustomed to tackling unusual jobs. These men had at their command a laboratory; a well equipped press department; heat treating equipment. They knew the characteristics of alloy steels intimately, and how to make the dies to work them successfully. They were experienced in design, and in the practical aspects of stamping production.

The experience and ingenuity of these men resulted in the successful production of the unusual stamping at a reasonable price. That's why Parish customers continue to come back for more.



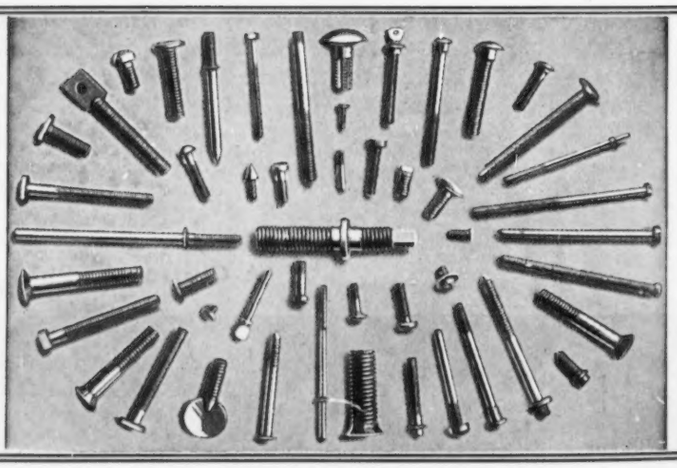
PARISH PRESSED STEEL CO.
READING, PA.
PACIFIC COAST REPRESENTATIVE
F. Somers, Peterson Co., 57 California St., San Francisco, Cal.

Machine Screws Special Screws
Special Studs Machine Screw Nuts

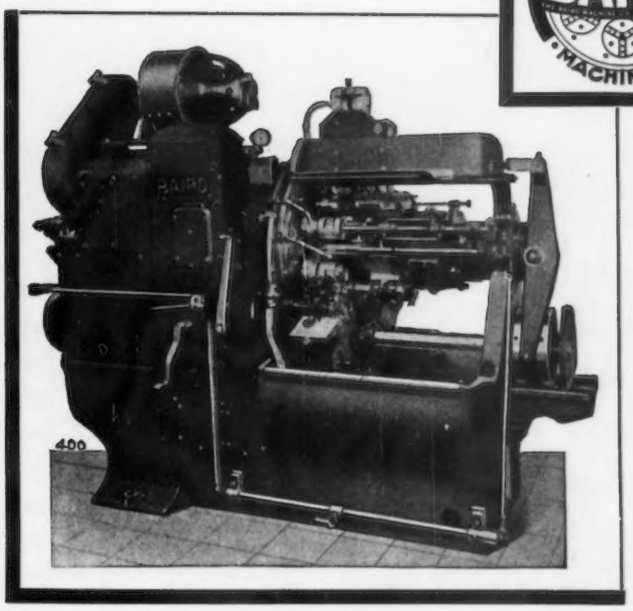
If you want real service, let us know your needs. Progressive Manufactured Products are made on both a quality and price basis. Their uniformity is your guarantee of speedier assembly.

Do you know about the savings made possible by our special heading process? Better get in touch with us.

The PROGRESSIVE MFG. CO.
TORRINGTON, CONN., U. S. A.
IN STOCK AT ALL TIMES—
Standard Machine Screws; Machine Screw Nuts; Interchangeable Bolts and Nuts made strictly to A.S.M.E. tolerances



Fast and Accurate!



In building this **Baird 7" Horizontal Automatic Chucking Machine** our aim was to produce a machine that would turn out accurate work at a fast rate, and that would stay accurate after a long period of service. Customers tell us our aim too was accurate, as the machines achieved these results.

In addition to high spindle speeds the time for indexing including "air cuts" of the tools is only 2.15 seconds for single indexing. Accuracy of parts machined meets the inspection departments' O.K.

Baird Chucking Machines perform all the usual lathe operations and also drilling, milling slots or oil grooves, inserting bushings, etc. Flexibility in tool setups and in operation makes this machine a decided asset to your machine shop. For quotations or estimates—

"Ask Baird About It"

THE BAIRD MACHINE COMPANY

BRIDGEPORT, CONN.

CROSBY *for* STAMPINGS

Serving Industry Since 1896

We have served more than a hundred industries with "Sheet Metal Stampings" during the past forty years, under uninterrupted and progressive management.

We are proud of this record.

Send your next Stamping inquiry to us and get acquainted with Crosby Service.



Made from 7/32" Steel

THE CROSBY COMPANY

General Offices and Works: BUFFALO, NEW YORK

Branch Offices: **Chicago** **Detroit** **Cleveland** **New York** **Philadelphia**

JUST BETWEEN US TWO

Beer Busts Into Art Circles

THE typesetter on a newspaper in a city 100 miles from New York recently had two ads to set, one for the annual festival and bazaar of a German singing society, and one for the annual exhibition of the local art school, to be held in a marble palace, where smiling is disorderly conduct, handshakes are neck-high, lorgnettes are as common as brass knuckles at a Canarsie chowder party—everything vera, vera ultra.

After he set the ads he had a line left over. It read, *"Imported Muenchen Lowenbrau Beer on Tap."*

Where do you suppose he placed it? Art lovers swooned, and searched in vain among the Monets and Goyas for the cool keg of Muenchen. To make matters worse, the newspaper published a correction. Thousands are grinning from ear to ear. Many faces are red, but none redder than the publisher's.

Feud

THE mysterious, mordant McC. inquires anonymously whether this column is supposed to be advertising matter, reading matter or neither.

We often wonder. But McC. errs in differentiating between advertising and reading matter. All of it is reading matter. Mrs. Mabel Potter Hanford, who, as space buyer of BBD&O, adv. agcy., perhaps buys more advertising space in business papers than does anyone else in the country, says:

> *"A fair study of business papers will, I believe, convince anyone that the advertising page is as important to the reader as the editorial content."*

That Mrs. Hanford is correct is evidenced by such letters as this, from the vice-president of a prominent Milwaukee metal products firm:

> *"The advertising pages, as well as the reading matter, in The Iron Age, are read regularly and carefully by all our executives. We find the ads very interesting and attractive and get some good information from them. We consider the advertising in The Iron Age of real value."*

The Milwaukee gentleman also makes the mistake of distinguishing advertising pages from reading matter. Obviously he means advertising pages and *editorial* matter. Therefore, we will excuse him, but not McC., who suggests that as a reward for merit this column be advanced to the obituary page. This time he signs himself "the undermined," and adds that he is about to collapse. Hurray!

Orchid—Outgoing

CONGRATULATIONS to Aetna-Standard for the faithfulness with which a galvanized sheet is simulated in the advertisement on page 4 of the June 11 issue.

Apology

AN anonymous note rebukes us for including asthma with the ailments that come with advancing years. We are informed that like hay fever it strikes infants and octogenarians impartially. Sorry.

Orchid—Incoming

HORACE C. KNERR, president of Metlab Metallurgical Laboratories, says that the tortoise and hare drawing on pages 42-43 of the June 11 issue is a masterpiece, and begs to offer congratulations to the unknown artist.

The artist is Harry Johnson, who couldn't turn out a poor job if he tried.

Eye-Stoppers

"DON'T DUNK!"—*Standard Oil Co. (Indiana), June 18 IA, page 79*

"NO SHERLOCKS NEEDED"—*Edison Storage Battery Division of Thomas A. Edison, Inc., June 18 IA, page 105*

"WHAT A SHELL IS TO A TURTLE . . ."—*American Hot Dip Galvanizers Association, June 18 IA, page 111*

Humor

THE *US Steel News* tells about the photographing of old-timers at the Clairton Works. They started with the 25-year men and worked their way up. When the call went out for 45-year service men, only one stepped forward, Frank J. Conway. When he realized he was alone, he hesitated, and was told, *"Go ahead, Frank, you sit in the middle."* Conway replied, *"How in H—l am I going to sit in the middle when there's nobody but me?"*

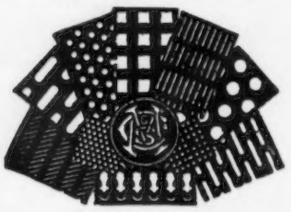
—A.H.D.

MUNDT
PERFORATED METALS

Large stocks of all metals always in hand ready to punch for any arrangement of perforations.

Sixty-one years of manufacturing perforated metals for every conceivable purpose assure satisfaction.

Write for Catalog of Patterns



TIN, STEEL, COPPER, ALUMINUM, BRONZE, BRASS, ZINC, ANY METAL, ANY PURPOSE

CHARLES MUNDT & SONS
52 FAIRMOUNT AVE., JERSEY CITY, N. J.

HENDRICK
PERFORATED METALS

Perforated Metal Screens in steel, bronze, Stainless Steel, Monel, Aluminum, Everdur and other metals. Perforated Grilles in various metals and many special designs.
Mitco Open Steel Flooring, Mitco Shur-Site Treads, Mitco Armogrids; also elevator buckets, conveyor troughs and products fabricated from heavy plate. Write for catalog.

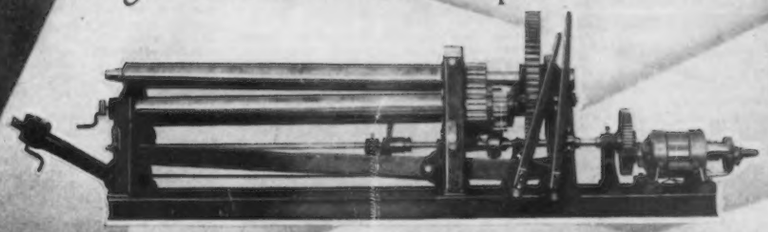
HENDRICK MFG. CO.
37 Dundaff Street Carbondale, Pa.
SALES OFFICES IN PRINCIPAL CITIES
PLEASE CONSULT TELEPHONE DIRECTORY

GET IN THE HABIT

of reading and using the classified sections—they are full of opportunities.

PLATE BENDING ROLLS

Capacities - Lightest sheet to heaviest plate



Our Line
Light and heavy machinery for all classes of sheet metal, plate and structural work.

BERTSCH & COMPANY
Cambridge City Indiana

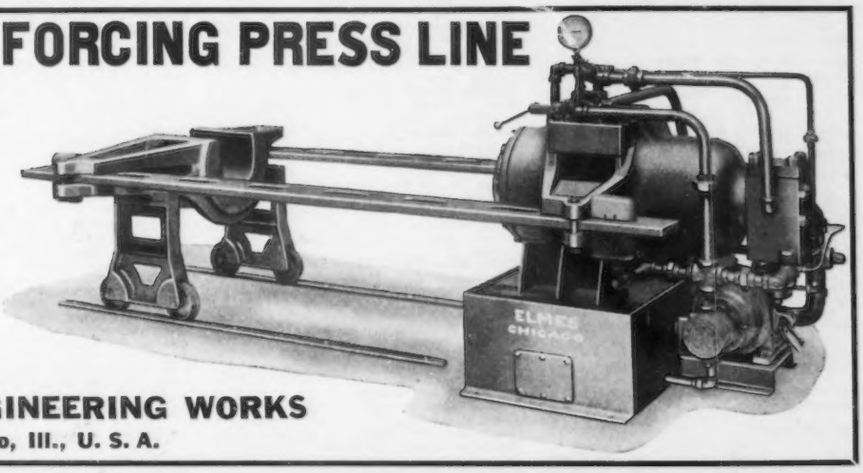
HYDRAULIC MACHINERY SINCE 1851 ELMES CHICAGO

1936 FORCING PRESS LINE

includes

NEW MODELS

with High- and Low-pressure Rotary Pumping Units—
Double Acting Cylinders—
Rapid Advance and Return—
Adjustable clearance between Bars—
Opening between Ram and Resistance Head to Suit.



CHARLES F. ELMES ENGINEERING WORKS
1003 Fulton St., Chicago, Ill., U. S. A.

HOLCROFT & COMPANY

LEADERS IN BUILDING AND DESIGNING ELECTRIC AND COMBUSTION FURNACES, KILNS AND OVENS.
HOME OFFICE: DETROIT—BRANCHES: CHICAGO, PHILADELPHIA
CANADA: WALKER METAL PRODUCTS, LTD., WALKERVILLE, ONT.

BUILT BY HOLCROFT & COMPANY DETROIT-MICH.



THE ATHENIA STEEL CO.

135 William Street, New York — Works, Athenia, N. J.

Makers of High Grade Tempered and Polished Steel for Clock, Watch, Motor and Typewriter Springs. Also Wound Springs. Tempered and Untempered Steel for other purposes. Special quality equal to finest imported for finish and accurate rolling. Also Stainless Steels of various grades.

AGENTS:—
Lapham Hickey Co.—3333 W. 47th Place, Chicago, Ill.—414 United Artists Bldg., Detroit, Mich.
E. F. Krause & Co.—817 Yale Street, Los Angeles, Calif.
Hill Chase & Co.—Richmond and Ontario Sts., Philadelphia, Pa.
Wetherell Bros. Co.—251 Albany St., Cambridge, Mass.

METALINE

(REGISTERED TRADE MARK)

OILLESS BEARINGS THAT REQUIRE NO ATTENTION

R. W. RHOADES METALINE CO., INC.
43—3rd St., Long Island City, N. Y.

FRICTION FEARS THIS FOE



Rely on Abbott for steel balls in precision and commercial tolerances

THE ABBOTT BALL COMPANY
1047 New Britain Ave., Hartford, Conn.

ABBOTT BEARING BALLS

New 1936 Model

SOUTH BEND LATHE

$75 LESS MOTOR DRIVE

The 9" x 3' Workshop Bench Lathe shown here is a precision lathe, with precision lead screw and back gears, capable of handling the finest and most accurate jobs in manufacturing, in the tool room and laboratory. With horizontal Countershaft, ¼ h.p. reversing motor, switch, and belting as shown $98.25

Write for new catalog and prices



SOUTH BEND LATHE WORKS
324 E. MADISON ST. SOUTH BEND, IND., U. S. A.

Products Index

ABRASIVE WHEELS — See Grinding Wheels

ABRASIVE CLOTH & PAPER
Norton Co., Worcester, Mass.

ABRASIVES—Steel Shot and Grit
American Foundry Equipment Co., The, 401 Byrkit St., Mishawaka, Ind.
Pangborn Corporation, Hagerstown, Md.

ACCUMULATORS—Hydraulic
Baldwin-Southwark Corp., Southwark Div., Philadelphia.
Lake Erie Engineering Corp., 68 Kenmore Sta., Buffalo, N. Y.
Watson-Stillman Co., The, 103 Aldene Rd., Roselle, N. J.
Wood, R. D., & Co., Philadelphia.

ACETYLENE—Dissolved in Cylinders
Air Reduction Sales Co., 60 East 42nd St., N. Y. C.
Linde Air Prods. Co., The, 30 East 42nd St., N. Y. C.

ACIDS—Pickling
American Chemical Paint Co., Ambler, Pa.
Grasselli Chemical Co., Inc., The, Cleve.

AIR CONDITIONING EQUIPMENT
Clarage Fan Co., Kalamazoo, Mich.

AIR TANKS AND CYLINDERS
Scaife, William B., & Sons Co., Ptgh.

ALLOYS—Calcium-Silicon
Electro Metallurgical Sales Corp., 30 East 42nd St., N. Y. C.

ALLOYS—Copper
American Brass Co., The, Waterbury, Conn.
American Radiator Co., 40 W. 40th St., New York City.
Mallory, P. R., & Co., Inc., Indianapolis, Ind.

ALLOYS—Magnesium
Dow Chemical Co., 921 Jefferson Ave., Midland, Mich.

ALLOYS—Phosphor Bronze
Phosphor Bronze Smelting Co., The, Phila.
Riverside (N. J.) Metal Co.

ALLOYS—Silico-Manganese
Electro Metallurgical Sales Corp., 30 East 42nd St., N. Y. C.

ALLOYS—Titanium
Metal & Thermit Corp., 120 B'way, N. Y. C.
Titanium Alloy Mfg. Co., The, Niagara Falls, N. Y.

ALLOYS—Tungsten
Vanadium Corp. of America, 420 Lexington Ave., N. Y. C.

ALLOYS—Vanadium
Vanadium Corp. of America, 420 Lexington Ave., N. Y. C.

ALUMINUM
Aluminum Co. of America, Pittsburgh.
Seligman, Arthur, & Co., Inc., 30 Rockefeller Plaza, R. C. A. Bldg., N. Y. C.

AMMETERS AND VOLTMETERS—Recording
Bristol Co., The, Waterbury, Conn.

AMMONIA RECOVERY PLANTS
Koppers Construction Co., The, Pittsburgh.

ANGLES, BEAMS, CHANNELS AND TEES
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Columbia Steel Co. (U. S. Steel Corp. Subsidiary), San Francisco, Calif.
Inland Steel Co., Chicago.
Jones & Laughlin Steel Corp., Pittsburgh.
Ryerson, Jos. T., & Son, Inc., Chicago.
Scully Steel Products Co. (U. S. Steel Corp. Subsidiary), Chicago.
Steel & Tubes, Inc., Cleveland.
Tennessee Coal, Iron & Railroad Co. (U. S. Steel Corp. Subsidiary), Birmingham, Ala.
Weirton (W. Va.) Steel Co.

ANGLES, BEAMS, CHANNELS & TEES —Magnesium Alloys
Dow Chemical Co., 921 Jefferson Ave., Midland, Mich.

ANNEALING—See Heat Treating

ANNEALING BOXES
United Engineering & Fdry. Co., Ptgh.

ANNEALING COVERS
Wilson, Lee Engineering Co., Cleveland.

ANODES—All Types
Grasselli Chemical Co., Inc., The, Cleve.
Seymour (Conn.) Mfg. Co.
Udylite Co., The, Detroit.

ANODES—Cadmium
Grasselli Chemical Co., Inc., The, Cleve.
Udylite Co., The, Detroit.

ARBORS
Morse Twist Drill & Mch. Co., New Bedford, Mass.

ARMORING MACHINERY—Cable, Wire, Hose
Sleeper & Hartley, Inc., Worcester, Mass.

ARRESTERS—Spark
Harrington & King Perforating Co., Chi.

AXLES—Car or Locomotive
American Car & Foundry Co., 30 Church St., N. Y. C.
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.

BALANCING EQUIPMENT
Olsen, Tinius, Testing Mch. Co., Phila., Pa.

BALING PRESSES—Scrap—See Presses —Baling

BALLS—Burnishing
Hartford (Conn) Steel Ball Co., The.

BALLS—Steel, Brass or Bronze
Abbott Ball Co., The, 1047 New Britain Ave., Hartford, Conn.
Fafnir Bearing Co., New Britain, Conn.
Hartford (Conn) Steel Ball Co., The.
New Departure Mfg. Co., Bristol, Conn.
SKF Industries, Inc., Front St. & Erie Ave., Phila., Pa.

BANDS—Steel
Acme Steel Co., Chicago.
Bethlehem (Pa.) Steel Company.
Tennessee Coal, Iron & Railroad Co. (U. S. Steel Corp. Subsidiary), Birmingham, Ala.

BANDS—Welded
Amer. Welding & Mfg. Co., Warren, O.

BARRELS—Burnishing
Abbott Ball Co., The, 1047 New Britain Ave., Hartford, Conn.

BARRELS—Tumbling
Baird Mch. Co., The, Bridgeport, Conn.
Hartford (Conn) Steel Ball Co., The.

BARS—Alloy
Republic Steel Corp., Cleveland, Ohio.

BARS—Aluminum.
Aluminum Co. of America, Pittsburgh.

BARS—Brass, Bronze or Copper
Bunting Brass & Bronze Co., Toledo, Ohio.

BARS—Cold Drawn
American Steel & Wire Co. (U. S. Steel Corp. Subsidiary), Chicago.
Union Drawn Steel Co., Massillon, Ohio.

BARS—Concrete, Reinforcing
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Columbia Steel Co. (U. S. Steel Corp. Subsidiary), San Francisco, Calif.
Inland Steel Co., Chicago.
Jones & Laughlin Steel Corp., Pittsburgh.
Laclede Steel Co., St. Louis, Mo.
Tennessee Coal, Iron & Railroad Co. (U. S. Steel Corp. Subsidiary), Birmingham, Ala.

BARS—Magnesium Alloys
Dow Chemical Co., 921 Jefferson Ave., Midland, Mich.

BARS—Rustless
Rustless Iron & Steel Corp., Baltimore, Md.

BARS—Steel
Ames, W., & Co., Jersey City, N. J.
Andrews Steel Co., The, Newport, Ky.
Bethlehem (Pa.) Steel Company.
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Great Lakes Steel Corp., Detroit.
Inland Steel Co., Chicago.
Jones & Laughlin Steel Corp., Pittsburgh.
Republic Steel Corp., Cleveland, Ohio.
Scully Steel Products Co. (U. S. Steel Corp. Subsidiary), Chicago.
Steel & Tubes, Inc., Cleveland.
Tennessee Coal, Iron & Railroad Co. (U. S. Steel Corp. Subsidiary), Birmingham, Ala.
Timken Roller Bearing Co., The, Canton, O.
Timken Steel & Tube Co., The, Canton, O.
Weirton (W. Va.) Steel Co.
Youngstown (Ohio) Sheet & Tube Co., The.

BASES—Column, Machinery
Lukens Steel Co., Coatesville, Pa.

BATTERIES—Storage
Edison Storage Battery, Div. of Thomas A. Edison, Inc., West Orange, N. J.
Electric Storage Battery Co., The, Phila.
Gould Storage Battery Corp., 600-650 Neoga St., Depew, N. Y.

BATTERY CHARGERS
Cutler-Hammer, Inc., Milwaukee.

BEAMS—See Angles, Beams, Channels and Tees

BEARINGS—Ball
Bantam Ball Bearing Co., The, South Bend, Indiana.
Fafnir Bearing Co., New Britain, Conn.
Federal Bearings Co., Inc., The, Poughkeepsie, N. Y.
New Departure Mfg. Co., Bristol, Conn.
Norma-Hoffmann Bearings Corp., Stamford, Conn.
SKF Industries, Inc., Front St. & Erie Ave., Phila., Pa.
Schatz Mfg. Co., The, Poughkeepsie, N. Y.

BEARINGS, Brass and Bronze
Ampco Metal, Inc., Milwaukee, Wis.
Bunting Brass & Bronze Co., Toledo, O.
Chrysler Corp., Amplex Div., Detroit, Mich.

BEARINGS—Oilless
Bunting Brass & Bronze Co., Toledo, O.
Rhoades, R. W., Metaline Co., Inc., Long Island City, N. Y.
Richardson Co., The, Melrose Park, Ill.

BEARINGS—Quill
Bantam Ball Bearing Co., The, South Bend, Indiana.

BEARINGS—Radial
Bantam Ball Bearing Co., The, South Bend, Indiana.
Fafnir Bearing Co., New Britain, Conn.
Federal Bearings Co., Inc., The, Poughkeepsie, N. Y.
Hyatt Roller Bearing Co., Newark, N. J.
New Departure Mfg. Co., Bristol, Conn.
Norma-Hoffmann Bearings Corp., Stamford, Conn.
SKF Industries, Inc., Front St. & Erie Ave., Phila., Pa.
Schatz Mfg. Co., The, Poughkeepsie, N. Y.

BEARINGS—Roll Neck
Bantam Ball Bearing Co., The, South Bend, Indiana.
Morgan Construction Co., Worcester, Mass.
Richardson Co., The, Melrose Park, Ill.
S K F Industries, Inc., Front St. & Erie Ave., Phila., Pa.
Timken Roller Bearing Co., The, Canton, O.

BEARINGS—Roller
Bantam Ball Bearing Co., The, South Bend, Indiana.
Hyatt Roller Bearing Co., Newark, N. J.
Norma-Hoffmann Bearings Corp., Stamford, Conn.
SKF Industries, Inc., Front St. & Erie Ave., Phila., Pa.
Timken Roller Bearing Co., The, Canton, O.

BEARINGS—Roller Tapered
Bantam Ball Bearing Co., The, South Bend, Indiana.
Timken Roller Bearing Co., The, Canton, O.

BEARINGS—Rolling Mill Equipment
Bantam Ball Bearing Co., The, South Bend, Indiana.
S K F Industries, Inc., Front St. & Erie Ave., Phila., Pa.
Timken Roller Bearing Co., The, Canton, O.

BEARINGS—Self Lubricating
Chrysler Corp., Amplex Div., Detroit, Mich.

BEARINGS—Shaft Hanger
Fafnir Bearing Co., New Britain, Conn.
Hyatt Roller Bearing Co., Newark, N. J.
Norma-Hoffmann Bearings Corp., Stamford, Conn.
SKF Industries, Inc., Front St. & Erie Ave., Phila., Pa.

BEARINGS—Thrust
Bantam Ball Bearing Co., The, South Bend, Indiana.
Fafnir Bearing Co., New Britain, Conn.
Federal Bearings Co., Inc., The, Poughkeepsie, N. Y.
Hyatt Roller Bearing Co., Newark, N. J.
New Departure Mfg. Co., Bristol, Conn.
Norma-Hoffmann Bearings Corp., Stamford, Conn.
SKF Industries, Inc., Front St. & Erie Ave., Phila., Pa.
Schatz Mfg. Co., The, Poughkeepsie, N. Y.
Timken Roller Bearing Co., The, Canton, O.

BELT DRESSING
Graton & Knight Co., Worcester, Mass.

BELT FASTENERS
Bristol Co., The, Waterbury, Conn.
Graton & Knight Co., Worcester, Mass.

BELT LACER
Bristol Co., The, Waterbury, Conn.

BELT LACING
Graton & Knight Co., Worcester, Mass.

BELT—Conveyor, Elevator
Goodrich, B. F., Co., The, Akron, Ohio.
Graton & Knight Co., Worcester, Mass.
Manhattan Rubber Mfg. Div. of Raybestos-Manhattan, Inc., The, 2 Townsend St., Passaic, N. J.

BELTING CEMENT
Graton & Knight Co., Worcester, Mass.

BELTING—Leather
Chicago (Ill.) Rawhide Mfg. Co., The, 1306 Elston Ave.
Graton & Knight Co., Worcester, Mass.
Houghton, E. F., & Co., Philadelphia.

BELTING—Metal, Conveyor, High and Low Temperature
Wickwire Spencer Steel Co., 41 East 42nd St., N. Y. C.

BELTING—Rubber
Goodrich, B. F., Co., The, Akron, Ohio.
Goodyear Tire & Rubber Co., Akron, Ohio.
Graton & Knight Co., Worcester, Mass.
Manhattan Rubber Mfg. Div. of Raybestos-Manhattan, Inc., The, 2 Townsend St., Passaic, N. J.
Robins Conveying Belt Co., 15 Park Row, N. Y. C.

BELTS—V-Type
Allis-Chalmers Mfg. Co., Milwaukee.
Graton & Knight Co., Worcester, Mass.
Manhattan Rubber Mfg. Div. of Raybestos-Manhattan, Inc., The, 2 Townsend St., Passaic, N. J.

BENCH LEGS—Steel
New Britain-Gridley Mch. Co., The, New Britain, Conn.

BENDING MACHINES—Hand, Band and Angle
Excelsior Tool & Mch. Co., E. St. Louis, Ill.

BENDING MACHINES—Hand and Power
Cincinnati (Ohio) Shaper Co., The.
Dreis & Krump Mfg. Co., Chicago.
Kane & Roach, Inc., Syracuse, N. Y.
Niagara Machine & Tool Works, Buffalo, N. Y.

BENZOL RECOVERY PLANTS
Koppers Construction Co., The, Pittsburgh.

BERYLLIUM COPPER
Riverside (N. J.) Metal Co.

BILLETS—Alloy Steel
Andrews Steel Co., The, Newport, Ky.

BILLETS—Carbon Steel
Andrews Steel Co., The, Newport, Ky.

BILLETS—Carbon Vanadium Steel
Andrews Steel Co., The, Newport, Ky.

BILLETS—Chrome Nickel Steel
Andrews Steel Co., The, Newport, Ky.
Rustless Iron & Steel Corp., Baltimore, Md.

BILLETS—Chrome Steel
Andrews Steel Co., The, Newport, Ky.
Rustless Iron & Steel Corp., Baltimore, Md.

BILLETS—Die Block Steel
Andrews Steel Co., The, Newport, Ky.

BILLETS—Forging
Alan Wood Steel Co., Conshohocken, Pa.
Andrews Steel Co., The, Newport, Ky.
Central Iron & Steel Co., Harrisburg, Pa.
Harrisburg (Pa.) Steel Corp.
Lukens Steel Co., Coatesville, Pa.
Midvale Co., The, Nicetown, Phila., Pa.
Republic Steel Corp., Cleveland, Ohio.

BILLETS—Nickel Steel
Andrews Steel Co., The, Newport, Ky.

BILLETS—Re-rolling
Alan Wood Steel Co., Conshohocken, Pa.
Andrews Steel Co., The, Newport, Ky.

BILLETS—Steel
Bethlehem (Pa.) Steel Company.
Continental Steel Corp., Kokomo, Ind.
Tennessee Coal, Iron & Railroad Co. (U. S. Steel Corp. Subsidiary), Birmingham, Ala.

BLANKS—Chisel
Cleveland Steel Tool Co., The, 660 E. 82nd St., Cleveland, Ohio.

BLANKS—Gear and Pinion
Chicago (Ill.) Rawhide Mfg. Co., The, 1306 Elston Ave.

BLANKS, STEEL—Gear, Flywheel
Lukens Steel Co., Coatesville, Pa.

BLAST GATES
Rockwell, W. S., Co., 50 Church St., N. Y. C.

BLOCKS—Chain
Yale & Towne Mfg. Co., The, Phila. Div., Phila., Pa.

BLOCKS—Creosoted
Jennison-Wright Co., Toledo, Ohio.

BLOWERS
Clarage Fan Co., Kalamazoo, Mich.
Spencer Turbine Co., Hartford, Conn.

BLOWPIPES — Soldering, Heating, Annealing
American Gas Furnace Co., Elizabeth, N.J.
Weldit Acetylene Co., Detroit.

BLUE PRINTING EQUIPMENT
Bruning, Chas., Co., Inc., 102 Reade St., N. Y. C.

BOARDS—Hammer
Irwin, H. G., Lumber Co., 1129 State St., Erie, Pa.

BOLT CUTTERS
Acme Mchry. Co., Cleveland, O.
Landis Mch. Co., Inc., Waynesboro, Pa.

BOLT AND NUT MACHINERY
Acme Machinery Co., Cleveland.
Ajax Mfg. Co., The, Euclid, Ohio.
Landis Machine Co., Inc., Waynesboro, Pa.
Manville, E. J., Mch. Co., Waterbury, Ct.
Waterbury (Ct.) Farrel Fdry. & Mch. Co.

BOLT & RIVET CLIPPERS
Bremil Mfg. Co., Erie, Pa.
Helwig Mfg. Co., St. Paul, Minn.

BOLTS—Carriage and Machine
Cleveland (Ohio) Cap Screw Co., The.
Milton (Pa.) Mfg. Co.
Republic Steel Corp., Upson Nut Div., Cleveland, O.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.

BOLTS—Special
Republic Steel Corp., Upson Nut Div., Cleveland, O.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.

BOLTS—Stove
Blake & Johnson Co., The, Waterville, Ct.

BOLTS—Track
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Republic Steel Corp., Upson Nut Div., Cleveland, O.

BOLTS AND NUTS
Ames, W., & Co., Jersey City, N. J.
Clark Bros. Bolt Co., Millidale, Conn.
Milton (Pa.) Mfg. Co.
Oliver Iron & Steel Corp., Pittsburgh.
Republic Steel Corp., Cleveland, Ohio.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.

BOND—Grinding Wheel
Bakelite Corp., 247 Park Ave., N. Y. C.

BORING—Hollow
American Hollow Boring Co., 1912 Raspberry St., Erie, Pa.

BORING BARS
Bullard Co., The, Bridgeport, Conn.

BORING, DRILLING & MILLING MACHINES—Horizontal
Hill-Clarke Mchry. Co., 647 W. Washington Blvd., Chicago.
Lucas Machine Tool Co., Cleveland.
National Automatic Tool Co., Richmond, Ind.
Universal Boring Machine Co., Hudson, Mass.

BORING & DRILLING MACHINES—Vertical
Baker Bros., Inc., Toledo, Ohio.
Bullard Co., The, Bridgeport, Conn.

BORING MACHINES—Diamond
Ex-Cell-O Aircraft & Tool Corp., 1200 Oakman Blvd., Detroit.

BORING MACHINES—Diamond & Carbide Tools
Herld Mch. Co., Worcester, Mass.

BORING MACHINES—Jig
Pratt & Whitney Co., Hartford, Conn.

BORING & TURNING MILLS—Vertical
Bullard Co., The, Bridgeport, Conn.
Cincinnati (Ohio) Planer Co.

BOXES—Steel
Berger Mfg. Co., The, Canton, Ohio.

BRAKE LINING AND BLOCKS—Asbestos
Manhattan Rubber Mfg. Div. of Raybestos-Manhattan, Inc., The, 2 Townsend St., Passaic, N. J.

BRAKES—Electric
Cutler-Hammer, Inc., Milwaukee.

BRAKES—Electric & Mechanical
Clark Controller Co., The, Cleveland.
Electric Controller & Mfg. Co., The, Cleveland.

BRAKES—Metal Forming
Cincinnati (Ohio) Shaper Co., The.
Dreis & Krump Mfg. Co., Chicago.
Pels, Henry, & Co., Inc., 90 West St., N. Y. C.
Schatz Mfg. Co., The, Poughkeepsie, N. Y.
Steelweld Machinery Co., Cleveland.

BRICK—Fire Clay
Carborundum Co., The, Niagara Falls, N. Y.
Illinois Clay Products Co., Joliet, Ill.

BRIDGE BUILDERS
American Bridge Co. (U. S. Steel Corp. Subsidiary), Pittsburgh.
Belmont Iron Works, Philadelphia.

BRIDGE OPERATING MACHINERY—Movable
Earle Gear & Mch. Co., Philadelphia.

BROACHES
Illinois Tool Works, Chicago, Ill.

BROACHING MACHINES
Bullard Co., The, Bridgeport, Conn.
Cincinnati (Ohio) Milling Mch. Co., The.
Oilgear Co., The, 1311 W. Bruce St., Milwaukee.

BRONZE FOR DIES
Ampco Metal, Inc., Milwaukee, Wis.

BRONZE—Phosphor
Bunting Brass & Bronze Co., Toledo, Ohio.
Phosphor Bronze Smelting Co., The, Phila.
Revere Copper & Brass, Inc., 230 Park Ave., N. Y. C.
Riverside (N. J.) Metal Co.
Seymour (Conn.) Mfg. Co.

BUCKETS—Clamshell
Hayward Co., The, 50 Church St., N. Y. C.
Industrial Brownhoist Corp., Bay City, Mich.

BUCKETS—Electric Motor
Hayward Co., The, 50 Church St., N. Y. C.

BUCKETS—Elevator
Jeffrey Mfg. Co., The, Columbus, Ohio.

BUCKETS—Orange Peel
Hayward Co., The, 50 Church St., N. Y. C.

BUILDINGS—Steel
American Bridge Co. (U. S. Steel Corp. Subsidiary), Pittsburgh.
Belmont Iron Works, Philadelphia.

BULLDOZERS
Ajax Mfg. Co., The, Euclid, Ohio.
Beaty Mch. & Mfg. Co., 936—15th St., Hammond, Ind.
Steelweld Machinery Co., Cleveland.

BULLDOZERS—Hydraulic
Elmes, Chas. F., Engng. Wks., Chicago.

BURNERS—Oil or Gas
Wilson, Lee Engineering Co., Cleveland.

BUSHINGS—Bronze
Ampco Metal, Inc., Milwaukee, Wis.
Bunting Brass & Bronze Co., Toledo, O.
Chrysler Corp., Amplex Div., Detroit, Mich.

Phosphor Bronze Smelting Co., The, Phila.
Shenango-Penn Mold Co., Pittsburgh.

BUSHINGS—Oilless
Rhoades, R. W., Metaline Co., Inc., Long Island City, N. Y.

BUSHINGS—Phosphor Bronze
Bunting Brass & Bronze Co., Toledo, Ohio.
Phosphor Bronze Smelting Co., The, Phila.

BY-PRODUCTS COKE AND GAS OVENS
Koppers Construction Co., The, Pittsburgh.

CABLE—Electric
General Electric Co., Schenectady, N. Y.

CABLEWAYS AND TRAMWAYS — See Tramways

CADMIUM
Grasselli Chemical Co., Inc., The, Cleve.
Udylite Co., The, Detroit.

CADMIUM PLATING PROCESS
Grasselli Chemical Co., Inc., The, Cleve.
Udylite Co., The, Detroit.

CALCIUM CARBIDE
Linde Air Prods. Co., The, 30 East 42nd St., N. Y. C.

CARBIC
Linde Air Prods. Co., The, 30 East 42nd St., N. Y. C.

CARBIDE
Air Reduction Sales Co., 60 East 42nd St., N. Y. C.
Linde Air Prods. Co., The, 30 East 42nd St., N. Y. C.

CARBIDE—Boron
Norton Co., Worcester, Mass.

CARBURIZING—See Heat Treating

CARS—Dump
American Car & Foundry Co., 30 Church St., N. Y. C.

CARS—Industrial and Mining
American Car & Foundry Co., 30 Church St., N. Y. C.
Atlas Car & Mfg. Co., The, Cleveland.
Bartlett, C. O., & Snow Co., The, Cleveland.

CASE HARDENING—See Heat Treating

CASTINGS—Acid or Heat Resisting
American Manganese Steel Co., Chicago Heights, Ill.
Ampco Metal, Inc., Milwaukee, Wis.
Duriron Co., Inc., The, 438 N. Findlay St., Dayton, Ohio.
Hoskins Mfg. Co., Detroit, Mich.
Midvale Co., The, Nicetown, Phila., Pa.

CASTINGS—Alloy Steel
Massillon (Ohio) Steel Casting Co., The.
Midvale Co., The, Nicetown, Phila., Pa.

CASTINGS—Aluminum
Aluminum Co. of America, Pittsburgh.

CASTINGS—Brass, Bronze, Copper or Aluminum
Cadman, A. W., Mfg. Co., Pittsburgh.
Phosphor Bronze Smelting Co., The, Phila.
Snyder, W. P., & Co., Pittsburgh.
Spencer's, I. S., Sons, Inc., Guilford, Ct.

CASTINGS—Corrosion Resisting
American Manganese Steel Co., Chicago Heights, Ill.
Midvale Co., The, Nicetown, Phila., Pa.

CASTINGS—Die, Aluminum
Aluminum Co. of America, Pittsburgh.

CASTINGS—Electric Steel
Industrial Steel Casting Co., The, Toledo.
Massillon (Ohio) Steel Casting Co., The.

CASTINGS—Gray Iron
American Engineering Co., Philadelphia.
Cheney, S., & Son, Manlius, N. Y.
Love Bros., Inc., Aurora, Ill.
Midvale Co., The, Nicetown, Phila., Pa.
National Roll & Fdry. Co., Avonmore, Pa.
North Wales (Pa.)) Mach. Co., Inc.
Spencer's, I. S., Sons, Inc., Guilford, Ct.
Taylor-Wilson Mfg. Co., McKees Rocks, Pa.

CASTINGS—Gray Iron Production
Forest City Foundries Co., The, Cleveland.

CASTINGS—Magnesium Alloys
Dow Chemical Co., 921 Jefferson Ave., Midland, Mich.

CASTINGS—Malleable
Lake City Malleable Co., The, 5100 Lakeside Ave., Cleveland.
Malleable Iron Fittings Co., Branford, Ct.
Peoria (Ill.) Malleable Castings Co.

CASTINGS—Manganese Steel
American Manganese Steel Co., Chicago Heights, Ill.

CASTINGS—Monel & Nickel
Superior Bronze Corp., Erie, Pa.

CASTINGS—Semi-Steel
American Car & Foundry Co., 30 Church St., N. Y. C.
Malleable Iron Fittings Co., Branford, Ct.

CASTINGS—Semi-Steel Alloy
Forest City Foundries Co., The, Cleveland.

CASTINGS—Steel
Bethlehem (Pa.) Steel Company.
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Columbia Steel Co. (U. S. Steel Corp. Subsidiary), San Francisco, Calif.
Crucible Steel Castings Co., Lansdowne, Pa.
Industrial Steel Castings Co., The, Toledo.
Malleable Iron Fittings Co., Branford, Ct.
Massillon (Ohio) Steel Casting Co., The.
Mesta Mch. Co., Pittsburgh.
Midvale Co., The, Nicetown, Phila., Pa.
Standard Steel Works Co., Burnham, Pa.

CEMENT—Quick Setting, Acid Proof & Insulator
Nukem Products Corp., 68 Niagara St., Buffalo, N. Y.

CEMENT—Refractory
Carborundum Co., The, Perth Amboy, N. J.

CEMENT—Rubber
Goodrich, B. F., Co., The, Akron, Ohio.

CHAINS—Conveyor & Elevator
American Chain Co., Inc., Bridgeport, Conn.
Baldwin-Duckworth Chain Corp., Springfield, Mass.
Bartlett, C. O., & Snow Co., The, Cleveland.
Diamond Chain & Mfg. Co., Indianapolis, Ind.
Jeffrey Mfg. Co., The, Columbus, Ohio.

CHAINS—Power Transmission
Baldwin-Duckworth Chain Corp., Springfield, Mass.
Boston Gear Works, Inc., North Quincy, Mass.
Diamond Chain & Mfg. Co., Indianapolis, Ind.
Jeffrey Mfg. Co., The, Columbus, Ohio.
Link-Belt Co., Chicago.
Morse Chain Co., Ithaca, New York.
Whitney Chain & Mfg. Co., Hartford, Ct.

CHAINS—Roller
Baldwin-Duckworth Chain Corp., Springfield, Mass.
Bartlett, C. O., & Snow Co., The, Cleveland.
Diamond Chain & Mfg. Co., Indianapolis, Ind.
Link-Belt Co., Chicago.
Morse Chain Co., Ithaca, New York.
Whitney Chain & Mfg. Co., Hartford, Ct.

CHAINS—Silent
Link-Belt Co., Chicago.
Morse Chain Co., Ithaca, New York.
Whitney Chain & Mfg. Co., Hartford, Ct.

CHAINS—Sling
American Chain Co., Inc., Bridgeport, Conn.

CHAINS—Welded
American Chain Co., Inc., Bridgeport, Conn.

CHANNELS—See Angles, Beams, Channels and Tees

CHECKS—Metal
Noble & Westbrook Mfg. Co., The, East Hartford, Ct.

CHEMICALS—Industrial
Grasselli Chemical Co., Inc., The, Cleveland.

CHEMICALS—Rust Proofing
Alrose Chemical Co., Providence, R. I.
Parker Rust-Proof Co., 2186 Milwaukee Ave., Detroit.
Udylite Co., The, Detroit.

CHROMIUM METAL
Electro Metallurgical Sales Corp., 30 East 42nd St., N. Y. C.

CHROMIUM PLATING — See Plating-Chromium

CHUCKING MACHINES—Automatic
New Britain-Gridley Mch. Co., The, New Britain, Conn.

CHUCKING MACHINES—Multiple Spindle
Baird Mch. Co., The, Bridgeport, Conn.
Goss & DeLeeuw Machine Co., The, New Britain, Conn.
National Acme Co., The, Cleveland.

CHUCKS—Air Operated
Hannifin Mfg. Co., Chicago.

CHUCKS—Drill
Cleveland (Ohio) Twist Drill Co., The.
Cushman Chuck Co., Hartford, Conn.
Morse Twist Drill & Mach. Co., New Bedford, Mass.

CHUCKS—Electric
Cushman Chuck Co., Hartford, Conn.

CHUCKS—Lathe
Cushman Chuck Co., Hartford, Conn.

CHUCKS—Magnetic
Heald Mch. Co., Worcester, Mass.
Taft-Peirce Mfg. Co., The, Woonsocket, R. I.

CIRCLES—Phosphor Bronze
Phosphor Bronze Smelting Co., The, Phila.
Revere Copper & Brass, Inc., 230 Park Ave., N. Y. C.
Riverside (N. J.) Metal Co.

CLAMPS—Machinists'
Danly Machine Specialties, Inc., Chicago.

CLEANERS—Metal
American Chemical Paint Co., Ambler, Pa.
Detroit Rex Products Co., Detroit, Mich.
Ford, J. B., Co., The, Wyandotte, Mich.
Nukem Products Corp., 68 Niagara St., Buffalo, N. Y.

CLEANING COMPOUNDS—Alkali
Detroit Rex Products Co., Detroit, Mich.

CLEANING EQUIPMENT—Metal
Detroit Rex Products Co., Detroit, Mich.

CLEANING EQUIPMENT (Metal)—Electro-Chemical
Bullard Co., The, Bridgeport, Conn.

CLEANING MATERIALS—Glass
Nukem Products Corp., 68 Niagara St., Buffalo, N. Y.

CLOTHING—Asbestos & Fireproof
Safety Equipment Service Co., The, Cleve.

CLUTCHES
Fairbanks, Morse & Co., Chicago.
Falls Clutch & Mchry. Co., The, Cuyahoga Falls, Ohio.
Hilliard Corp., The, Railroad Ave., Elmira, N. Y.
Medart Co., The, St. Louis, Mo.
Morse Chain Co., Ithaca, New York.

CLUTCHES—Magnetic
Cutler-Hammer, Inc., Milwaukee.
Dings Magnetic Separator Co., Milwaukee.
Magnetic Mfg. Co., 626 South 28th St., Milwaukee.

CLUTCHES—Overrunning
Hilliard Corp., The, Railroad Ave., Elmira, N. Y.
Morse Chain Co., Ithaca, New York.

COAL
Cleveland-Cliffs Iron Co., Cleveland, Ohio.
Hanna Furnace Corp., The, Detroit, Mich.
Koppers Coal Co., Inc., The, Pittsburgh.

COAL, ORE AND ASH HANDLING MACHINERY
Bartlett, C. O., & Snow Co., The, Cleveland.
Jeffrey Mfg. Co., The, Columbus, Ohio.
Robins Conveying Belt Co., 15 Park Row, N. Y. C.

COBALT, METAL
Central Trading Corp., 511 Fifth Ave., N. Y. C.

COILS—Pipe
Harrisburg (Pa.) Steel Corp.
Pittsburgh (Pa.) Piping & Equip. Co.

COKE—Metallurgical
Cleveland-Cliffs Iron Co., Cleveland, Ohio.

COKE OVEN MACHINERY
Atlas Car & Mfg. Co., The, Cleveland.
Koppers Construction Co., The, Pittsburgh.

COKE OVENS—By-Products
Koppers Construction Co., The, Pittsburgh.

COKE OVENS—Cross Regenerators
Koppers Construction Co., The, Pittsburgh.

COKE OVENS—With Recovery of By-Products
Koppers Construction Co., The, Pittsburgh.

COMBUSTION CONTROLS
Morgan Construction Co., Worcester, Mass.

COMPOUNDS—Drawing
Gulf Oil Corp. of Pa., Gulf Refining Co., Pittsburgh.
Penola, Inc., Pittsburgh.
Socony-Vacuum Oil Co., Inc., 26 Broadway, N. Y. C.
Standard Oil Co. (Indiana), Chicago.
Tide Water Oil Co., 17 Battery Place, N. Y. C.

Products Index

COMPRESSED AIR DRYERS
Ruemelin Mfg. Co., 3860 N. Palmer St., Milwaukee, Wis.

COMPRESSORS—Air
Chicago Pneumatic Tool Co., 6 East 44th St., N. Y. C.
Fairbanks, Morse & Co., Chicago.
Ingersoll-Rand Co., 11 Broadway, New York City.
Pennsylvania Pump & Compressor Co., Easton, Pa.
Spencer Turbine Co., Hartford, Conn.
Westinghouse Air Brake Co., Industrial Div., Pittsburgh.
Worthington Pump & Mchry. Corp., Harrison, New Jersey.

COMPRESSORS—Gas
Chicago Pneumatic Tool Co., 6 East 44th St., N. Y. C.
Worthington Pump & Mchry. Corp., Harrison, New Jersey.

CONDENSERS—Surface & Jet
Ingersoll-Rand Co., 11 Broadway, N. Y. C.
Pennsylvania Pump & Compressor Co., Easton, Pa.
Westinghouse Electric & Mfg. Co., So. Phila. Wks., Phila., Pa.
Worthington Pump & Mchry. Corp., Harrison, New Jersey.

CONTRACTORS' SUPPLIES — Second-Hand. (See Clearing House Section)

CONTROLLERS—Crane
Cutler-Hammer, Inc., Milwaukee.

CONTROLLERS—Electric
Clark Controller Co., The, Cleveland.
Cutler-Hammer, Inc., Milwaukee.
Electric Controller & Mfg. Co., The, Cleveland.
General Electric Co., Schenectady, N. Y.

CONTROLLERS—Valve, Electrically Operated
Cutler-Hammer, Inc., Milwaukee.
Vickers, Inc., 1420 Oakman Blvd., Detroit, Mich.

CONVEYING AND ELEVATING MACHINERY
Bartlett, C. O., & Snow Co., The, Cleveland.
Jeffrey Mfg. Co., The, Columbus, Ohio.
Link-Belt Co., Chicago.
Logan Co., Inc., Louisville, Ky.
Mathews Conveyer Co., Ellwood City, Pa.
Robins Conveying Belt Co., 15 Park Row, N. Y. C.

CONVEYOR WORMS
Lee Spring Co., Inc., 30 Main St., Brooklyn, N. Y.

CONVEYORS—Gravity
Logan Co., Inc., Louisville, Ky.
Mathews Conveyer Co., Ellwood City, Pa.

CONVEYORS—Monorail
American Monorail Co., Cleveland.

CONVEYORS—Portable
Jeffrey Mfg. Co., The, Columbus, Ohio.
Robins Conveying Belt Co., 15 Park Row, N. Y. C.

COPING MACHINES
Schatz Mfg. Co., The, Poughkeepsie, N. Y.

CORE OIL
Penola, Inc., Pittsburgh.
Socony-Vacuum Oil Co., Inc., 26 Broadway, N. Y. C.
Sun Oil Co., Philadelphia.
Tide Water Oil Co., 17 Battery Place, N. Y. C.

CORUNDUM WHEELS — See Grinding Wheels

COTTERS AND KEYS—Spring
Hindley Mfg. Co., Valley Falls, R. I.
Hubbard, M. D., Spring Co., 750 Central Ave., Pontiac, Mich.
Western Wire Prods. Co., St. Louis, Mo.

COUNTERBORES
Cleveland (Ohio) Twist Drill Co., The.
Morse Twist Drill & Mch. Co., New Bedford, Mass.

COUNTERS—Production
Durant Mfg. Co., Milwaukee, Wis.
Veeder-Root, Inc., Hartford, Ct.

COUNTERS—Revolution, Recording
Bristol Co., The, Waterbury, Conn.
Durant Mfg. Co., Milwaukee, Wis.

COUNTING MACHINES
Veeder-Root, Inc., Hartford, Conn.

COUPLINGS—Cut-Off Friction
Hilliard Corp., The, Railroad Ave., Elmira, N. Y.

COUPLINGS—Flexible
Diamond Chain & Mfg. Co., Indianapolis, Ind.
Lovejoy Tool Works, Chicago.
Morse Chain Co., Ithaca, New York.
Thomas Flexible Coupling Co., Warren, Pa.

COUPLINGS—Pipe
Harrisburg (Pa.) Steel Corp.
National Tube Co. (U. S. Steel Corp. Subsidiary), Pittsburgh.

CRANES—Crawling Tractor
Harnischfeger Corp., 4401 W. National Ave., Milwaukee.
Industrial Brownhoist Corp., Bay City, Mich.
Ohio Locomotive Crane Co., The, Bucyrus, Ohio.

CRANES — Electric, Industrial, Truck Mounted
Baker-Raulang Co., 2175 W. 25th St., Cleveland.
Elwell-Parker Electric Co., The, Cleveland.

CRANES—Electric Traveling
Armel, James P., Ptgh.
Cleveland Crane & Engineering Co., Wickliffe, Ohio.
Euclid Crane & Hoist Co., The, Euclid, O.
Harnischfeger Corp., 4401 W. National Ave., Milwaukee, Wis.
Morgan Engineering Co., The, Alliance, O.
Robbins & Myers, Inc., Springfield, Ohio.
Shaw-Box Crane & Hoist Co., Inc., 402 Broadway, Muskegon, Mich.
Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.
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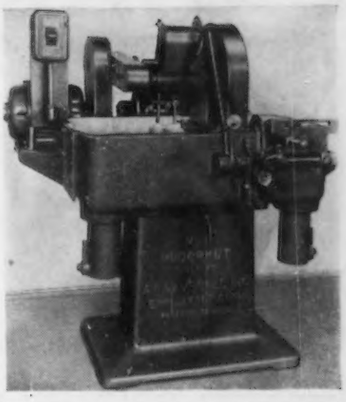
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Chicago (Ill.) Rawhide Mfg. Co., The, 1306 Elston Ave.
General Electric Co., Schenectady, N. Y.
James, D. O., Mfg. Co., Chicago.
GEARS—Rawhide
Chicago (Ill.) Rawhide Mfg. Co., The, 1306 Elston Ave.
GEARS—Spur
Boston Gear Wks., Inc., North Quincy, Mass.
James, D. O., Mfg. Co., Chicago.
Philadelphia (Pa.) Gear Works.
Simonds Mfg. Co., Pittsburgh.
GEARS—Worm
Boston Gear Wks., Inc., North Quincy, Mass.
Cleveland (Ohio) Worm & Gear Co.
Horsburgh & Scott Co., 5112 Hamilton Ave., Cleveland.
James, D. O., Mfg. Co., Chicago.
Michigan Tool Co., Detroit, Mich.
Philadelphia (Pa.) Gear Works.
GENERATORS—Acetylene
Air Reduction Sales Co., 60 East 42nd St., N. Y. C.
Linde Air Prods. Co., The, 30 East 42nd St., N. Y. C.
GENERATORS—Electric
Fairbanks, Morse & Co., Chicago.
Lincoln Electric Co., The, Cleveland.
Reliance Electric & Engng. Co., Cleveland.
Westinghouse Elec. & Mfg. Co., East Pitgh.
GENERATORS — Electric, Second Hand. (See Clearing House Section)
GLOVES—Asbestos & Fireproof
Safety Equipment Service, Co., The, Cleve.
GOGGLES—Safety
American Optical Co., Southbridge, Mass.
Safety Equipment Service, Co., The, Cleve.
GOVERNORS—Air Compressor
Westinghouse Air Brake Co., Industrial Div., Pittsburgh.
GRATING—Flooring, Sidewalk, etc.—See Flooring—Open Steel
GREASE—Lubricating
Gulf Oil Corp. of Pa., Gulf Refining Co., Pittsburgh.
Penola, Inc., Pittsburgh.
Socony-Vacuum Oil Co., Inc., 26 Broadway, N. Y. C.
Standard Oil Co. (Indiana), Chicago.
Sun Oil Co., Philadelphia.
Tide Water Oil Co., 17 Battery Place N. Y. C.
GRILLES—Metal Cane
Diamond Mfg. Co., Wyoming, Pa.

Cuts Clean + Cool!

The CAMPBELL HUDORKUT *cuts almost any material quickly, cleanly, economically*



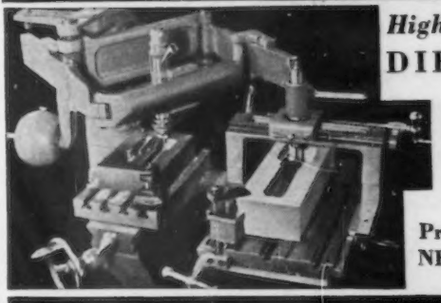
● Through the medium of an abrasive disc revolving at about one-half the usual dry-cutting speed, with the work submerged in a coolant, the Hudorkut cuts almost any commercial material, cleanly and smoothly, without heating or burning. . . . Little or no finishing is required. . . . The Hudorkut is semi-automatic in action. . . . It is fully described in Bulletin DH-790 which will be sent upon request.

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NEW YORK SALES AGENT—Wm. H. Leonori & Co., Inc. 30 Howard St.

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CLEVELAND — Paterson-Leitch Company, 900 E. 69th Street.

BUFFALO—J. J. Lambert, 323 Huntington Avenue.

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SAN FRANCISCO — Charles L. Lewis, 703 Market Street.

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GRILLES—Perforated Metal
Erdle Perforating Co., Rochester, N. Y.
Harrington & King Perforated Co., Chicago.

GRINDING AND POLISHING MACHINES
Calder, Geo. H., Co., Lancaster, Pa.
Cincinnati (Ohio) Grinders, Incorporated.
Excelsior Tool & Mch. Co., E.St.Louis, Ill.
Norton Co., Worcester, Mass.

GRINDING MACHINES—Centerless
Cincinnati (Ohio) Grinders, Incorporated.

GRINDING MACHINES—Chucking
Bryant Chucking Grinder Co., Springfield, Vt.

GRINDING MACHINES — Cutter & Reamer
Cincinnati (Ohio) Grinders, Incorporated.
Landis Tool Co., Waynesboro, Pa.
Thompson Grinder Co., The, Springfield, Ohio.

GRINDING MACHINES—Cylinder
Heald Mch. Co., Worcester, Mass.
Hutto Machine Division, Carborundum Co., Detroit.

GRINDING MACHINES—Cylindrical
Brown & Sharpe Mfg. Co., Providence, R.I.
Cincinnati (Ohio) Grinders, Incorporated.
Landis Tool Co., Waynesboro, Pa.
Norton Co., Worcester, Mass.

GRINDING MACHINES—Die
Landis Mch. Co., Inc., Waynesboro, Pa.

GRINDING MACHINES—Gear & Worm
Pratt & Whitney Co., Hartford, Conn.

GRINDING MACHINES—Hob
Barber-Colman Co., Rockford, Ill.

GRINDING MACHINES—Internal
Bryant Chucking Grinder Co., Springfield, Vt.
Greenfield (Mass.) Tap & Die Corp.
Heald Mch. Co., Worcester, Mass.
Hutto Machine Division, Carborundum Co., Detroit.

GRINDING MACHINES—Internal Centerless
Heald Mch. Co., Worcester, Mass.

GRINDING MACHINES—Internal Multiple Spindle
Baird Mch. Co., The, Bridgeport, Conn.

GRINDING MACHINES—Portable Electric
Chicago Pneumatic Tool Co., 6 East 44th St., N. Y. C.

GRINDING MACHINES—Portable Flexible Shaft
Strand, N. A., & Co., Chicago.

GRINDING MACHINES—Portable Pneumatic
Buckeye Portable Tool Co., The, Dayton, O.
Chicago Pneumatic Tool Co., 6 East 44th St., N. Y. C.
Ingersoll-Rand Co., 11 Broadway, New York City.
Warner & Swasey Co., The, Cleveland.

GRINDING MACHINES—Roll
Cincinnati (Ohio) Grinders, Incorporated.
Farrel-Birmingham Co., Inc., Ansonia, Conn.
Landis Tool Co., Waynesboro, Pa.

GRINDING MACHINES—Snagging
Warner & Swasey Co., The, Cleveland.

GRINDING MACHINES—Surface
Abrasive Machine Tool Co., E. Prov., R. I.
Blanchard Machine Co., The, Cambridge, Mass.
Heald Mch. Co., Worcester, Mass.
Norton Co., Worcester, Mass.
Pratt & Whitney Co., Hartford, Conn.
Thompson Grinder Co., The, Springfield, Ohio.

GRINDING MACHINES—Tool
Cincinnati (Ohio) Grinders, Incorporated.
Landis Tool Co., Waynesboro, Pa.
LeBlond, R. K., Mch. Tool Co., Cincinnati.
Norton Co., Worcester, Mass.

GRINDING MACHINES—Universal
Cincinnati (Ohio) Grinders, Incorporated.
Landis Tool Co., Waynesboro, Pa.
Norton Co., Worcester, Mass.
Thompson Grinder Co., The, Springfield, Ohio.

GRINDING MACHINES—Valve
Landis Tool Co., Waynesboro, Pa.

GRINDING WHEEL DRESSERS AND CUTTERS
Calder, Geo. H., Co., Lancaster, Pa.

GRINDING WHEELS
Bakelite Corp., 247 Park Ave., N. Y. C.
Blanchard Machine Co., The, Cambridge, Mass.
Carborundum Co., The, Niagara Falls, N. Y.
Macklin Co., Jackson, Mich.
Manhattan Rubber Mfg. Div. of Raybestos-Manhattan, Inc., The, 2 Townsend St., Passaic, N. J.
Norton Co., Worcester, Mass.

GRINDING WHEELS—Segment
Blanchard Machine Co., The, Cambridge, Mass.

GRIT—Steel
Pittsburgh (Pa.) Crushed Steel Co.

HACK SAW BLADES—See Saws—Hack Saw Blades

HACK SAW MACHINES
Armstrong-Blum Mfg. Co., Chicago.
Peerless Machine Co., Racine, Wis.
Racine (Wis.) Tool & Machine Co., 1755 State St.

HAMMERS—Air, Forging
Nazel Engng. & Mch. Wks., Philadelphia

HAMMERS—Drop
Bliss, E. W., Co., Toledo, Ohio
Chambersburg (Pa.) Engineering Co.
Erie (Pa.) Foundry Co.
Morgan Engineering Co., The, Alliance, O.

HAMMERS—Pneumatic
Chicago Pneumatic Tool Co., 6 East 44th St., N. Y. C.
Ingersoll-Rand Co., 11 Broadway, New York City.

HAMMERS—Power
Chambersburg (Pa.) Engineering Co.

HAMMERS—Rawhide
Chicago (Ill.) Rawhide Mfg. Co., 1306 Elston Ave.

HAMMERS—Steam
Chambersburg (Pa.) Engineering Co.
Erie (Pa.) Foundry Co.
Morgan Engineering Co., The, Alliance, O.

HANGERS—Ball Bearing
Fafnir Bearing Co., New Britain, Conn.
S K F Industries, Inc., Front St. & Erie Ave., Phila., Pa.

HANGERS—Roller Bearing
Hyatt Roller Bearing Co., Newark, N. J.

HARDNESS TESTING MACHINES
Olsen, Tinius, Testing Mch. Co., Phila., Pa.
Shore Instrument & Mfg. Co., The, Jamaica, L. I., N. Y.

HEADING MACHINES
Ajax Mfg. Co., The, Euclid, Ohio.
Manville, E. J., Mch. Co., Waterbury, Ct.

HEADS—Spun and Pressed
Central Iron & Steel Co., Harrisburg, Pa.
Lukens Steel Co., Coatesville, Pa.
Worth Steel Co., Claymont, Del.

HEADS, Steel—Flanged and Dished
Central Iron & Steel Co., Harrisburg, Pa.
Lukens Steel Co., Coatesville, Pa.

HEAT TREATING
Barnes-Gibson-Raymond, Inc., Detroit.
Barnes, Wallace Co., The, Bristol, Conn.
General Machine Wks., York, Pa.
Gibson, Wm. D., Co., Chicago.
Parish Pressed Steel Co., Reading, Pa.

HEAT TREATING COMPOUNDS
Houghton, E. F., & Co., Philadelphia.

HOBS
Illinois Tool Works, Chicago, Ill.
Michigan Tool Co., Detroit, Mich.

HOISTS—Air
Chicago Pneumatic Tool Co., 6 East 44th St., N. Y. C.
Detroit (Mich.) Hoist & Mach. Co.
Ingersoll-Rand Co., 11 Broadway, N. Y. C.
Ridgway, Craig & Son Co., Coatesville, Pa.

HOISTS—Chain
Wright Mfg. Co., York, Pa.
Yale & Towne Mfg. Co., The, Phila. Div., Phila., Pa.

HOISTS—Electric
American Engineering Co., Philadelphia.
Detroit (Mich.) Hoist & Mach. Co.
Euclid Crane & Hoist Co., The, Euclid, O.
Harnischfeger Corp., 4401 W. National Ave., Milwaukee, Wis.
Philadelphia (Pa.) Gear Works.
Robbins & Myers, Inc., Springfield, Ohio.
Shaw-Box Crane & Hoist Co., Inc., 402 Broadway, Muskegon, Mich.
Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.
Wright Mfg. Co., York, Pa.
Yale & Towne Mfg. Co., The, Phila. Div., Phila., Pa.

HOISTS—Electric Traveling
Cleveland Tramrail Div. of The Cleveland Crane & Engng. Co., Wickliffe, Ohio.
Euclid Crane & Hoist Co., The, Euclid, O.
Shaw-Box Crane & Hoist Co., Inc., 402 Broadway, Muskegon, Mich.

HOISTS—Monorail
Cleveland Tramrail Div. of The Cleveland Crane & Engng. Co., Wickliffe, Ohio.
Euclid Crane & Hoist Co., The, Euclid, O.
Shaw-Box Crane & Hoist Co., Inc., 402 Broadway, Muskegon, Mich.
Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.

HONING MACHINES
Barnes Drill Co., Rockford, Ill.

HOSE—Rubber
Goodrich, B. F., Co., The, Akron, Ohio.
Goodyear Tire & Rubber Co., Akron, Ohio.
Manhattan Rubber Mfg. Div. of Raybestos-Manhattan, Inc., The, 2 Townsend St., Passaic, N. J.

HYDRANTS—Fire
Wood, R. D., & Co., Philadelphia.

HYDRAULIC FEEDS
Vickers, Inc., 1420 Oakman Blvd., Detroit, Mich.

HYDRAULIC MACHINERY
Baldwin-Southwark Corp., Southwark Div., Philadelphia.
Chambersburg (Pa.) Engineering Co.
Elmes, Chas. F., Engng. Wks., Chicago.
Lake Erie Engineering Corp., 68 Kenmore Sta., Buffalo, N. Y.
Morgan Engineering Co., The, Alliance, O.
Watson-Stillman Co., The, 103 Aldene Rd., Roselle, N. J.
Wood, R. D., & Co., Philadelphia.

INDICATORS—Dial
Federal Products Corp., Providence, R. I.

INGOT MOLDS
Shenango Furnace Co., Pittsburgh.
Shenango-Penn Mold Co., Pittsburgh.
Snyder, W. P., & Co., Pittsburgh.

INGOTS—Aluminum
Aluminum Co. of America, Pittsburgh.
Seligman, Arthur, & Co., Inc., 30 Rockefeller Plaza, R. C. A. Bldg., N. Y. C.

INGOTS—Phosphor Bronze
Phosphor Bronze Smelting Co., The, Phila.

INHIBITORS
American Chemical Paint Co., Ambler, Pa.
Grasselli Chemical Co., Inc., The, Cleveland.

INSTRUMENTS—Recording
Bristol Co., The, Waterbury, Conn.
Brown Instrument Co., The, Philadelphia.
Leeds & Northrup Co., Philadelphia.

IRON—Genuine Open Hearth Iron
Newport (Ky.) Rolling Mill Co., The.

IRON—Rustless
Ludlum Steel Co., Watervliet, N. Y.

IRON—Staybolt
Burden Iron Co., Troy, N. Y.

JIGS, FIXTURES, DIES, etc. (See Dies, Jigs, Fixtures, etc.)

KEYS—Riveted
Western Wire Prods. Co., St. Louis, Mo.

KEYSEATING MACHINES
Baker Bros., Inc., Toledo, Ohio.
Davis Keyseater Co., 490 Exchange St., Rochester, N. Y.

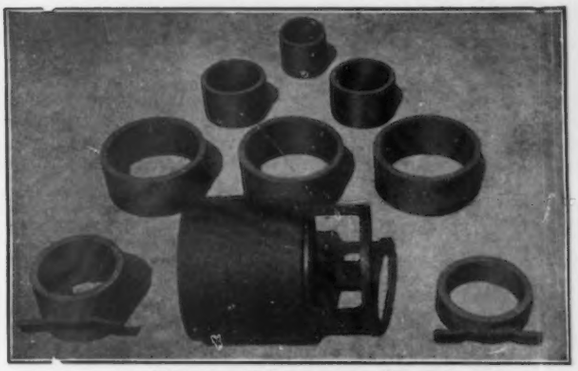
LACING—Belt, Rawhide or Leather
Chicago (Ill.) Rawhide Mfg. Co., The, 1306 Elston Ave.

LACQUER
Maas & Waldstein Co., Newark, N. J.
Roxalin Flexible Lacquer Co., Inc., Elizabeth, New Jersey.
Sherwin-Williams Co., Cleveland
Zapon Div., Atlas Powder Co., Stamford, Conn.

LADDERS—Safety
Dayton Safety Ladder Co., Cincinnati.

LAMPS—Filament
General Electric Co., Cleveland.
Westinghouse Lamp Co., 30 Rockefeller Plaza, N. Y. C.

LAMPS—Mercury Vapor
General Electric Vapor Lamp Co., Hoboken, N. J.
LAMPS—Mercury Vapor & Filament Combination
Westinghouse Electric & Mfg. Co., Light-Div., Cleveland, Ohio.
LATHES—Automatic
Baird Mch. Co., The. Bridgeport, Conn.
Bullard Co., The. Bridgeport, Conn.
Goss & De Leeuw Mch. Co., The, New Britain, Conn.
Jones & Lamson Mch. Co., Springfield, Vt.
LeBlond, R. K., Mch. Tool Co., Cincinnati.
Monarch Mch. Tool Co., The, Sidney, O.
Townsend, H. P., Mfg. Co., The, Hartford, Conn.
LATHES—Automatic Vertical
Baird Mch. Co., The, Bridgeport, Conn.
Bullard Co., The, Bridgeport, Conn.
LATHES—Bench
Hardinge Bros., Inc., Elmira, N. Y.
Pratt & Whitney Co., Hartford, Conn.
South Bend (Ind.) Lathe Works, 595 E. Madison St.
LATHES—Brass
Warner & Swasey Co., The, Cleveland.
LATHES—Chucking
Jones & Lamson Mch. Co., Springfield, Vt.
Warner & Swasey Co., The, Cleveland.
LATHES—Contour Turning
Monarch Mch. Tool Co., The, Sidney, O.
LATHES—Crankshaft
LeBlond, R. K., Mch. Tool Co., Cincinnati.
LATHES—Engine
American Tool Works Co., Cincinnati, Ohio.
Hill-Clarke Mchry. Co., 647 W. Washington Blvd., Chicago.
LeBlond, R. K., Mch. Tool Co., Cincinnati.
Lehmann Machine Co., St. Louis, Mo.
Monarch Mch. Tool Co., The, Sidney, O.
Pratt & Whitney Co., Hartford, Conn.
South Bend (Ind.) Lathe Works, 595 E. Madison St.
LATHES—Roll
Lewis Foundry & Mch. Co., Pittsburgh.
Mesta Mch. Co., Pittsburgh.
United Engineering & Fdry. Co., Pgh.
LATHES — Second-Hand. (See Clearing House Section)
LATHES—Toolroom
Monarch Mch. Tool Co., The, Sidney, O.
Pratt & Whitney Co., Hartford, Conn.
LATHES—Turret
Acme Machine Tool Co., Cincinnati.
Bardons & Oliver, Cleveland.
Bullard Co., The, Bridgeport, Conn.
Jones & Lamson Mch. Co., Springfield, Vt.
Warner & Swasey Co., The, Cleveland.
LATHES—Turret, Vertical
Bullard Co., The, Bridgeport, Conn.
LEAD—In Oil
Sherwin-Williams Co., Cleveland.
LEATHER—Cup
Chicago (Ill.) Rawhide Mfg. Co., The, 1306 Elston Ave.
LEGGINS—Safety
Safety Equipment Service Co., The, Cleve.
LEVELING MACHINES
Aetna-Standard Engineering Co., The, Youngstown, Ohio.
Torrington (Conn.) Mfg. Co., The.
Wean Engineering Co., Inc., The, Warren, Ohio.
Schatz Mfg. Co., The, Poughkeepsie, N. Y.
LEVELS—Precision Machine Aligning
Universal Boring Machine Co., Hudson, Mass.
LOCK WASHER MACHINERY
Sleeper & Hartley, Inc., Worcester, Mass.
LOCKS
Corbin Cabinet Lock Co., New Britain, Conn.
LOCOMOTIVES—Electric
Atlas Car & Mfg. Co., The, Cleveland.
General Electric Co., Schenectady, N. Y.
LOCOMOTIVES—Gasoline
Plymouth (Ohio) Locomotive Works.
LOCOMOTIVES—Industrial
Jeffrey Mfg. Co., The, Columbus, Ohio.
Plymouth (Ohio) Locomotive Works.
LOCOMOTIVES—Storage Battery
Atlas Car & Mfg. Co., The, Cleveland.
LUBRICANTS—Crusher & Grinding
Gulf Oil Corp. of Pa., Gulf Refining Co., Pittsburgh.
Penola, Inc., Pittsburgh.
Socony-Vacuum Oil Co., Inc., 26 Broadway, N. Y. C.
Sun Oil Co., Philadelphia.
Texas Company, The, 135 East 42nd St., N. Y. C.
Tide Water Oil Co., 17 Battery Place, N. Y. C.
LUBRICANTS—Gear
Gulf Oil Corp. of Pa., Gulf Refining Co., Pittsburgh.
Penola, Inc., Pittsburgh.
Socony-Vacuum Oil Co., Inc., 26 Broadway N. Y. C.
Standard Oil Co. (Indiana), Chicago.
Sun Oil Co., Philadelphia.
Texas Company, The, 135 East 42nd St., N. Y. C.
Tide Water Oil Co., 17 Battery Place, N. Y. C.
LUBRICANTS—High Pressure & Temperature
Gulf Oil Corp. of Pa., Gulf Refining Co., Pittsburgh.
Penola, Inc., Pittsburgh.
Socony-Vacuum Oil Co., Inc., 26 Broadway, N. Y. C.
Standard Oil Co. (Indiana), Chicago.
Sun Oil Co., Philadelphia.
Texas Company, The, 135 East 42nd St., N. Y. C.
Tide Water Oil Co., 17 Battery Place, N. Y. C.
LUBRICANTS—Mine Cars
Gulf Oil Corp. of Pa., Gulf Refining Co., Pittsburgh.
Penola, Inc., Pittsburgh.
Socony-Vacuum Oil Co., Inc., 26 Broadway, N. Y. C.
Sun Oil Co., Philadelphia.
Texas Company, The, 135 East 42nd St., N. Y. C.
Tide Water Oil Co., 17 Battery Pl., N.Y.C.
LUBRICANTS—Mining Machines
Gulf Oil Corp. of Pa., Gulf Refining Co., Pittsburgh.
Penola, Inc., Pittsburgh.
Socony-Vacuum Oil Co., Inc., 26 Broadway, N. Y. C.
Sun Oil Co., Philadelphia.
Texas Company, The, 135 East 42nd St., N. Y. C.
Tide Water Oil Co., 17 Battery Pl., N.Y.C.
LUBRICANTS—Railroad
Gulf Oil Corp. of Pa., Gulf Refining Co., Pittsburgh.
Penola, Inc., Pittsburgh.
Socony-Vacuum Oil Co., Inc., 26 Broadway, N. Y. C.
Sun Oil Co., Philadelphia.
Texas Company, The, 135 East 42nd St., N. Y. C.
Tide Water Oil Co., 17 Battery Place, N. Y. C.
LUBRICANTS—Roll Neck—Anti-Friction & Plain
Gulf Oil Corp. of Pa., Gulf Refining Co., Pittsburgh.
Penola, Inc., Pittsburgh.
Socony-Vacuum Oil Co., Inc., 26 Broadway, N. Y. C.
Standard Oil Co. (Indiana), Chicago.
Sun Oil Co., Philadelphia.
Texas Company, The, 135 East 42nd St., N. Y. C.
Tide Water Oil Co., 17 Battery Place, N. Y. C.
LUBRICANTS—Tipple & Cleaning
Gulf Oil Corp. of Pa., Gulf Refining Co., Pittsburgh.
Penola, Inc., Pittsburgh.
Socony-Vacuum Oil Co., Inc., 26 Broadway, N. Y. C.
Sun Oil Co., Philadelphia.
Texas Company, The, 135 East 42nd St., N. Y. C.
Tide Water Oil Co., 17 Battery Place, N. Y. C.
MACHINE GUARD MATERIALS
Erdle Perforating Co., Rochester, N. Y.
MACHINE WORK
General Machine Works, York, Pa.
Taft-Peirce Mfg. Co., The, Woonsocket, R.I.
MACHINERY DEALERS — Second-Hand. (See Clearing House Section)
MACHINISTS' SMALL TOOLS
Starrett, L. S., Co., Athol, Mass.
MAGNESITE—Brick or Dead Burnt
Carborundum Co., The, Perth Amboy, N. J.
MAGNESIUM
Dow Chemical Co., 921 Jefferson Ave., Midland, Mich.
MAGNETS—Lifting
Cutler-Hammer, Inc., Milwaukee.
Electric Controller & Mfg. Co., The, Cleve.
Ohio Electric Mfg. Co., The, 5908 Maurice Ave., Cleveland.
MALLETS—Rawhide
Chicago (Ill.) Rawhide Mfg. Co., The, 1306 Elston Ave.
MANGANESE METAL
Electro Metallurgical Sales Corp., 30 East 42nd St., N. Y. C.
Metal & Thermit Corp., 120 B'way, N. Y. C.
MANHOLE FITTINGS AND SADDLES
Worth Steel Co., Claymont, Del.
MANIFOLDS—Oxygen
Air Reduction Sales Co., 60 East 42nd St., N. Y. C.
Linde Air Prods. Co., The, 30 East 42nd St., N. Y. C.
MARKING MACHINES
Noble & Westbrook Mfg. Co., The, East Hartford, Conn.
METAL PARTS—Rubber Covered
American Hard Rubber Co., 11 Mercer St., N. Y. C.
METAL SPECIALTIES
Berger Mfg. Co., The, Canton, Ohio.
Crosby Co., The, Buffalo, N. Y.
Cuyahoga Springs Co., The, Cleveland.
Toledo (Ohio) Stamping & Mfg. Co.
Torrington (Ct.) Co.
Truscon Steel Co., Pressed Steel Div., Cleveland.
Whitehead Stamping Co., 1669 W. Lafayette Blvd., Detroit, Mich.
Worcester (Mass.) Stamped Metal Co.
METERS—Flow
Brown Instrument Co., The, Philadelphia.
METERS—Water & Oil
Worthington Pump & Mchry. Corp., Harrison, N. J.
MICROMETERS
Starrett, L. S., Co., Athol, Mass.
MICROMETERS—Automatic, for Rolling Mills
Haines Gauge Co., The, Phila., Pa.
MILLING MACHINES—Automatic
Brown & Sharpe Mfg. Co., Prov., R. I.
Cincinnati (Ohio) Milling Mch. Co., The.
MILLING MACHINES—Bench
Hardinge Bros., Inc., Elmira, N. Y.
MILLING MACHINES—Horizontal
Brown & Sharpe Mfg. Co., Prov., R. I.
Cincinnati (Ohio) Milling Mch. Co., The.
MILLING MACHINES—Planer Type
Cincinnati (Ohio) Planer Co.
MILLING MACHINES — Second-Hand. (See Clearing House Section)
MILLING MACHINES—Vertical
Brown & Sharpe Mfg. Co., Prov., R. I.
Cincinnati (Ohio) Milling Mch. Co., The.
MOLDING MACHINES—Jarring Air
Nicholls, W. H., Co., Inc., 8927—126th St., Richmond Hill, N. Y.
MOLDING MACHINES—Stripping Plate
Nicholls, W. H., Co., Inc., 8927—126th St., Richmond Hill, N. Y.
MOLYBDENUM
Climax Molybdenum Co., 500 Fifth Ave., N. Y. C.
MONEL METAL
International Nickel Co., Inc., The, 67 Wall St., N. Y. C.
MONORAIL SYSTEMS—Hand & Electric
American Monorail Co., Cleveland.
Cleveland Tramrail Div. of The Cleveland Crane & Engng. Co., Wickliffe, Ohio.
MOTORS—Electric
Allis-Chalmers Mfg. Co., Milwaukee.
Fairbanks, Morse & Co., Chicago.
General Electric Co., Schenectady, N. Y.
Harnischfeger Corp., 4401 W. National Ave., Milwaukee.
Lincoln Electric Co., Cleveland.
Reliance Electric & Engineering Co., Cleveland.
Westinghouse Elec. & Mfg. Co., E. Pgh.
MOTORS—Electric. Second-Hand. (See Clearing House Section)



Motor and Generator Frames
THE AMERICAN WELDING & MFG. CO., Warren, Ohio

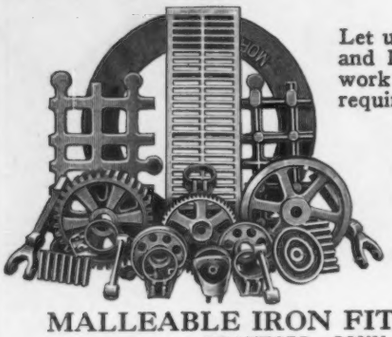
DROP-FORGINGS
any shape
any material
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Milton (Pa.) Mfg. Co.
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Palnut Co., The, 63 Cordier St., Irvington, N. J.

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Blake & Johnson Co., The, Waterville, Ct.

NUTS—Semi-Finished
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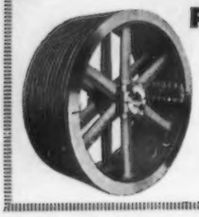
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Great Lakes Foundry Sand Co., Detroit.
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Linde Air Prods. Co., The, 30 East 42nd St., N. Y. C.

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Wickwire Spencer Steel Co., 41 East 42nd St., N. Y. C.

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Standard Steel Works Co., Burnham, Pa.

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American Car & Foundry Co., 30 Church St., N. Y. C.

RIVET MAKING MACHINERY
Acme Machinery Co., Cleveland.
Manville, E. J., Mch. Co., Waterbury, Ct.

RIVET SETS
Cleveland Steel Tool Co., The, 660 E. 82d St., Cleveland, Ohio.

RIVETING MACHINES
Hanniffin Mfg. Co., Chicago.
Shuster, F. B., Co., The, New Haven, Ct.
Townsend, H. P., Mfg. Co., The, Hartford, Conn.

RIVETS
Blake & Johnson Co., The, Waterville, Ct.
Clark Bros. Bolt Co., Millidale, Conn.
Hassall, John, Inc., Clay & Oakland Sts., Bklyn, N. Y.
Oliver Iron & Steel Corp., Pittsburgh.
Progressive Mfg. Co., Torrington, Conn.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.

ROD MILL MACHINERY
Torrington (Conn.) Mfg. Co., The.

RODS—Aluminum
Aluminum Co. of America, Pittsburgh.

RODS—Brass
American Brass Co., The, Waterbury, Conn.
Revere Copper & Brass, Inc., 230 Park Ave., N. Y. C.

RODS—Magnesium Alloys
Dow Chemical Co., 921 Jefferson Ave., Midland, Mich.

RODS—Nickel Silver
American Brass Co., The, Waterbury, Conn.
Riverside (N. J.) Metal Co.
Seymour (Conn.) Mfg. Co.

RODS—Phosphor Bronze
American Brass Co., The, Waterbury, Conn.
Phosphor Bronze Smelting Co., The, Phila.
Revere Copper & Brass, Inc., 230 Park Ave., N. Y. C.
Riverside (N. J.) Metal Co.
Seymour (Conn.) Mfg. Co.

RODS—Rustless
Rustless Iron & Steel Corp., Baltimore, Md.

RODS—Welding
Air Reduction Sales Co., 60 East 42nd St., N. Y. C.
American Brass Co., The, Waterbury, Conn.
American Steel & Wire Co. (U. S. Steel Corp. Subsidiary), Chicago.
Lincoln Electric Co., The, Cleveland.
Linde Air Prods. Co., The, 30 East 42nd St., N. Y. C.
Metal & Thermit Corp., 120 B'way, N. Y. C.
Pittsburgh (Pa.) Steel Co.
Revere Copper & Brass, Inc., 230 Park Ave., N. Y. C.

RODS—Wire
American Steel & Wire Co. (U. S. Steel Corp. Subsidiary), Chicago.
Continental Steel Corp., Kokomo, Ind.
Jones & Laughlin Steel Corp., Pittsburgh.
Pittsburgh (Pa.) Steel Co.
Wickwire Brothers, Cortland, N. Y.
Wickwire Spencer Steel Co., 41 East 42nd St., N. Y. C.
Youngstown (Ohio) Sheet & Tube Co., The.

ROLLING MACHINERY—Cold Rolling
Bliss, E. W., Co., Toledo, Ohio.
Lewis Foundry & Mch. Co., Pittsburgh.
United Engineering & Fdry. Co., Ptgh.

ROLLING MACHINERY—Sheet Metal
Lewis Foundry & Mch. Co., Pittsburgh.

ROLLING MILL MACHINERY
Aetna-Standard Engineering Co., The, Youngstown, Ohio.
Bliss, E. W., Co., Toledo, Ohio.
Farrel-Birmingham Co., Inc., Ansonia, Ct.
Hyde Park (Pa.) Fdry. & Mch. Co.
Lewis Foundry & Mch. Co., Pittsburgh.
Mesta Mch. Co., Pittsburgh.
Morgan Construction Co., Worcester, Mass.
Morgan Engineering Co., The, Alliance, O.
National Roll & Fdry. Co., Avonmore, Pa.
Torrington (Conn.) Mfg. Co., The.
United Engineering & Fdry. Co., Ptgh.
Waterbury (Ct.) Farrel Fdry. & Mch. Co.

ROLLS—Alloy Steel
Pittsburgh (Pa.) Rolls Corp.

ROLLS—Bending and Straightening
Baldwin-Southwark Corp., Southwark Div., Philadelphia.
Bertsch & Co., Cambridge City, Ind.
Kane & Roach, Inc., Syracuse, N. Y.
Lake Erie Engineering Corp., 68 Kenmore Sts., Buffalo, N. Y.
Niagara Machine & Tool Works, Buffalo, N. Y.
Schatz Mfg. Co., The, Poughkeepsie, N. Y.

ROLLS—Rubber Covered
Manhattan Rubber Mfg. Div. of Raybestos-Manhattan, Inc., The, 2 Townsend St., Passaic, N. J.

ROLLS—Sand Chilled Iron and Steel
Aetna-Standard Engineering Co., The, Youngstown, Ohio.
Hyde Park (Pa.) Fdry. & Mach. Co.
Lewis Foundry & Mch. Co., Pittsburgh.
Mesta Mch. Co., Pittsburgh.
National Roll & Fdry. Co., Avonmore, Pa.
Pittsburgh (Pa.) Rolls Corp.
United Engineering & Fdry. Co., Ptgh.

ROLLS—Special Hardened
Midvale Co., The Nicetown, Phila., Pa.

ROOFING—Special Copper Bearing Steel
Newport (Ky.) Rolling Mill Co., The.
Superior Sheet Steel Co., Canton, Ohio.

ROOFING AND SIDING—Corrugated and Plain
American Rolling Mill Co., Middletown, O.
American Sheet & Tin Plate Co. (U. S. Steel Corp. Subsidiary), Pittsburgh.
Newport (Ky.) Rolling Mill Co., The.
Weirton (W. Va.) Steel Co.
Youngstown (Ohio) Sheet & Tube Co., The.

ROOFING AND SIDING—Genuine Open Hearth Iron
Newport (Ky.) Rolling Mill Co.
Superior Sheet Steel Co., Canton, Ohio.

ROOFING AND SIDING—Iron and Steel
Newport (Ky.) Rolling Mill Co., The.

RUBBER LININGS
American Hard Rubber Co., 11 Mercer St., N. Y. C.
Goodrich, B. F., Co., The, Akron, Ohio.
Goodyear Tire & Rubber Co., Akron, Ohio.

RUBBER MOLDED PARTS
American Hard Rubber Co., 11 Mercer St., N. Y. C.
Goodyear Tire & Rubber Co., Akron, Ohio.
Manhattan Rubber Mfg. Div. of Raybestos-Manhattan, Inc., The, 2 Townsend St., Passaic, N. J.
Richardson Co., The, Melrose Park, Ill.

RUST PREVENTIVES
American Chemical Paint Co., Ambler, Pa.
American Lanolin Corp., Lawrence, Mass.
Parker Rust-Proof Co., 2186 Milwaukee Ave., Detroit.

RUST PROOFING COMPOUNDS
Parker Rust-Proof Co., 2186 Milwaukee Ave., Detroit.

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RUST REMOVING
Nukem Products Corp., 68 Niagara St., Buffalo, N. Y.

SAND BLAST EQUIPMENT AND MACHINES
American Foundry Equipment Co., The, 401 Byrkit St., Mishawaka, Ind.
Panghorn Corporation, Hagerstown, Md.
Ruemelin Mfg. Co., 3360 N. Palmer St., Milwaukee, Wis.

SAND—Foundry
Great Lakes Foundry Sand Co., Detroit.

SAND BLAST STEEL SHOT
American Foundry Equipment Co., The, 401 Byrkit St., Mishawaka, Ind.
Great Lakes Foundry Sand Co., Detroit.
Pittsburgh (Pa.) Crushed Steel Co.

SAND HANDLING EQUIPMENT
Bartlett, C. O., & Snow Co., The, Cleveland.
Jeffrey Mfg. Co., The, Columbus, Ohio.

SAND RAMMERS
Chicago Pneumatic Tool Co., 6 East 44th St., N. Y. C.

SAWING MACHINES—Metal
Espen-Lucas Mch. Works, Phila.
Peerless Machine Co., Racine, Wis.
Racine (Wis.) Tool & Machine Co., 1755 State St.

SAWS—Band and Hack for Metal
Armstrong-Blum Mfg. Co., Chicago.
Atkins, E. C., & Co., Indianapolis.
Disston, Henry, & Sons, Inc., Philadelphia.

SAWS—Circular, Rip & Cutoff
Atkins, E. C., & Co., Indianapolis.

SAWS—Friction
Atkins, E. C., & Co., Indianapolis.
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Atkins, E. C., & Co., Indianapolis.
Peerless Machine Co., Racine, Wis.
Starrett, L. S., Co., Athol, Mass.

SAWS—Hot Metal
Atkins, E. C., & Co., Indianapolis.
Disston, Henry, & Sons, Inc., Philadelphia.

SAWS—Inserted Tooth, Cold
Disston, Henry, & Sons, Inc., Philadelphia.
Tabor Mfg. Co., Philadelphia.

SAWS—Milling
Atkins, E. C., & Co., Indianapolis.
Disston, Henry, & Sons, Inc., Philadelphia.

SCALES
Fairbanks, Morse & Co., Chicago.

SCREENS—Perforated Metal
Chicago Perforating Co., 2440 W. 24th Place, Chicago, Ill.
Diamond Mfg. Co., Wyoming, Pa.
Erdle Perforating Co., Rochester, N. Y.
Harrington & King Perforating Co., Chi.
Hendrick Mfg. Co., Carbondale, Pa.
Mundt, Chas., & Sons, 59 Fairmount Ave., Jersey City, N. J.

SCREENS—Woven Wire
Michigan Wire Cloth Co., 2117 Howard St., Detroit.
Wickwire Brothers, Cortland, N. Y.
Wickwire Spencer Steel Co., 41 East 42nd St., N. Y. C.

SCREW MACHINE PRODUCTS
Barnes, Wallace, Co. The, Bristol, Conn.
Blake & Johnson Co., The, Waterville, Ct.
Commonwealth Brass Corp., Detroit.
Eastern Mch. Screw Corp., New Haven
National Acme Co., The, Cleveland.
New Britain-Gridley Mch. Co., The, New Britain, Conn.
Olson Mfg. Co., Worcester, Mass.
Ottemiller, Wm. H., Co., Inc., York, Pa.
Progressive Mfg. Co., Torrington, Conn.
Screw Mch. Products Corp., Prov., R. I.

SCREW MACHINERY—Automatic
Cone Automatic Mach. Co., Inc., Windsor, Vt.

National Acme Co., The, Cleveland.
New Britain-Gridley Mch. Co., The, New Britain, Conn.
Townsend, H. P., Mfg. Co., The, Hartford, Conn.

SCREW MACHINERY—Hand
Hardinge Bros., Inc., Elmira, N. Y.
Warner & Swasey Co., The, Cleveland.

SCREW MACHINERY—Multiple Spindle
Acme Machine Tool Co., Cincinnati.
Cone Automatic Mach. Co., Inc., Windsor, Vt.
National Acme Co., The, Cleveland.

SCREW MACHINERY—Wood
Townsend, H. P., Mfg. Co., The, Hartford, Conn.

SCREW PLATES
Greenfield (Mass.) Tap & Die Corp.

SCREW STOCKS
Union Drawn Steel Co., Massillon, Ohio.

SCREWS—Cap
Bristol Co., The, Waterbury, Conn.
Cleveland (Ohio) Cap Screw Co., The.
National Acme Co., The, Cleveland.
Ottemiller, Wm. H., Co., Inc., York, Pa.

SCREWS—Machine
Blake & Johnson Co., The, Waterville, Ct.
Progressive Mfg. Co., The, Torrington, Ct.

SCREWS—Safety Set
Bristol Co., The, Waterbury, Conn.
Progressive Mfg. Co., The, Torrington, Ct.
Standard Pressed Steel Co., Jenkintown, Pa.

SCREWS—Set
Bristol Co., The, Waterbury, Conn.
Cleveland (Ohio) Cap Screw Co., The.
National Acme Co., The, Cleveland.
Ottemiller, Wm. H., Co., Inc., York, Pa.

SCREWS, Socket, Head, Cap
Bristol Co., The, Waterbury, Conn.
Standard Pressed Steel Co., Jenkintown, Pa.

SCREWS—Thumb
Parker-Kalon Corp., 196 Varick St., N. Y.

SCRUBBING MACHINES—Sheet
Wean Engineering Co., Inc., The, Warren, Ohio.

SCYTHE STONES AND WHETSTONES
Carborundum Co., The, Niagara Falls, N. Y.

SECOND-HAND MACHINERY—(See Clearing House Section)

SEPARATORS—Magnetic
Dings Magnetic Separator Co., Milwaukee.
Magnetic Mfg. Co., 626 South 28th St., Milwaukee.
Ohio Electric Mfg. Co., The, 5908 Maurice Ave., Cleveland.

SHAFTING—Cold Drawn
Bliss & Laughlin, Inc., Harvey, Ill.
Union Drawn Steel Co., Massillon, Ohio.
Wyckoff Drawn Steel Co., Pittsburgh, Pa.

SHAFTING—Steel
Union Drawn Steel Co., Massillon, Ohio.

SHAFTING—Turned and Ground
Bliss & Laughlin, Inc., Harvey, Ill.
Ryerson, Jos. T., & Son, Inc., Chicago.
Union Drawn Steel Co., Massillon, Ohio.
Wyckoff Drawn Steel Co., Pittsburgh, Pa.

SHAPERS
Cincinnati (Ohio) Shaper Co., The.

SHAPERS—Horizontal
American Tool Works Co., Cincinnati, Ohio.

SHAPERS—Vertical
Pratt & Whitney Co., Hartford, Conn.

SHAPES—Cold Drawn
Bliss & Laughlin, Inc., Harvey, Ill.
Union Drawn Steel Co., Massillon, Ohio.
Wyckoff Drawn Steel Co., Pittsburgh, Pa.

SHAPES—Wire
Eastern Tool & Mfg. Co., Bloomfield, N. J.
Lee Spring Co., Inc., 30 Main St., Brooklyn, N. Y.
Roebling's, John A., Sons Co., Trenton, N. J.

SHEAR BLADES & KNIVES
Heppenstall Co., Pittsburgh.

SHEARING MACHINES—Alligator
Canton Fdry. & Mch. Co., Cleveland.

SHEARING MACHINES—Angle, Hand and Power
Federal Bearings Co., Inc., The, Poughkeepsie, N. Y.
G. D. S. Shearing & Punching Machine Co., 101 Walker St., N. Y. C.
Pels, Henry, & Co., Inc., 90 West St., N. Y. C.
Schatz Mfg. Co., The, Poughkeepsie, N. Y.

SHEARING MACHINES—Bar
G. D. S. Shearing & Punching Machine Co., 101 Walker St., N. Y. C.
Pels, Henry, & Co., Inc., 90 West St., N. Y. C.
Schatz Mfg. Co., The, Poughkeepsie, N.Y.
United Engineering & Fdry. Co., Pitgh.

SHEARING MACHINES—Beam and Channel
Pels, Henry, & Co., Inc., 90 West St., N. Y. C.
Schatz Mfg. Co., The, Poughkeepsie, N.Y.
United Engineering & Fdry. Co., Pitgh.

SHEARING MACHINES—Billet
Morgan Engineering Co., The, Alliance, O.
Pels, Henry & Co., Inc., 90 West St., N. Y. C.
Schatz Mfg. Co., The, Poughkeepsie, N. Y.
United Engineering & Fdry. Co., Pitgh.

SHEARING MACHINES—Continuous Sheet & Pack
Aetna-Standard Engineering Co., The, Youngstown, Ohio.

SHEARING MACHINES—Plate
Bertsch & Co., Cambridge City, Ind.
Cincinnati (Ohio) Shaper Co., The.
Dreis & Krump Mfg. Co., Chicago.
Mesta Mch. Co., Pittsburgh.
Morgan Engineering Co., The, Alliance, O.
Niagara Machine & Tool Works, Buffalo, N. Y.
Pels, Henry & Co., Inc., 90 West St., N.Y.C.
Schatz Mfg. Co., The, Poughkeepsie, N. Y.
United Engineering & Fdry. Co., Pitgh.

SHEARING MACHINES — Sheet and Plate
Beatty Mch. & Mfg. Co., 936—15th St., Hammond, Ind.
Cincinnati (Ohio) Shaper Co., The.
Dreis & Krump Mfg. Co., Chicago.
Niagara Mach. & Tool Wks., Buffalo, N. Y.

SHEARING MACHINES—Squaring
Cincinnati (Ohio) Shaper Co., The.
Dreis & Krump Co., Chicago.
Niagara Mach. & Tool Wks., Buffalo, N.Y.

SHEARS—Hand for Sheet Metal
Bremil Mfg. Co., Erie, Pa.

SHEAVES—V-Belt Cast Iron
Linderme Machine & Tool Co., Detroit.

SHEET BARS
Andrews Steel Co., The, Newport, Ky.
Jones & Laughlin Steel Corp., Pittsburgh.

SHEET METAL MACHINERY
Bliss, E. W., Co., Toledo, Ohio.
Cincinnati (Ohio) Shaper Co., The.
Dreis & Krump Mfg. Co., Chicago.
Kane & Roach, Inc., Syracuse, N. Y.
New Albany (Ind.) Mch. Mfg. Co.
Niagara Mech. & Tool Wks., Buffalo, N. Y.
V & O Press Co., Hudson, N. Y.

SHEET STEEL CONSTRUCTION
Berger Mfg. Co., The, Canton, Ohio.

SHEETS—Aluminum
Aluminum Co. of America, Pittsburgh.

SHEETS—Auto Body
American Rolling Mill Co., Middletown, O.
American Sheet & Tin Plate Co. (U. S. Steel Corp. Subsidiary), Pittsburgh.
Empire Sheet & Tin Plate Co., Mansfield, Ohio.
Republic Steel Corp., Cleveland, Ohio.
Youngstown (Ohio) Sheet & Tube Co., The.

SHEETS—Black
American Rolling Mill Co., Middletown, O.
American Sheet & Tin Plate Co. (U. S. Steel Corp. Subsidiary), Pittsburgh.
Columbia Steel Co. (U. S. Steel Corp. Subsidiary), San Francisco, Calif.
Continental Steel Corp., Kokomo, Ind.
Empire Sheet & Tin Plate Co., Mansfield, Ohio.
Granite City (Ill.) Steel Co.
Ingersoll Steel & Disc Co., Chicago.
Inland Steel Co., Chicago.
Newport (Ky.) Rolling Mill Co., The.
Republic Steel Corp., Cleveland, Ohio.
Scully Steel Products Co. (U. S. Steel Corp. Subsidiary), Chicago.
Superior Sheet Steel Co., Canton, Ohio.
Tennessee Coal, Iron & Railroad Co., (U. S. Steel Corp. Subsidiary), Birmingham, Ala.
Weirton (W. Va.) Steel Co.

SHEETS—Blue Annealed
Alan Wood Steel Co., Conshohocken, Pa.
American Rolling Mill Co., Middletown, O.
American Sheet & Tin Plate Co. (U. S. Steel Corp. Subsidiary), Pittsburgh.
Central Iron & Steel Co., Harrisburg, Pa.
Empire Sheet & Tin Plate Co., Mansfield, Ohio.
Granite City (Ill.) Steel Co.
Great Lakes Steel Corp., Detroit.
Lukens Steel Co., Coatesville, Pa.
Newport (Ky.) Rolling Mill Co., The.
Ryerson, Jos. T., & Son, Inc., Chicago.
Superior Sheet Steel Co., Canton, Ohio.
Weirton (W. Va.) Steel Co.
Worth Steel Co., Claymont, Del.

SHEETS—Brass, Bronze, Copper, Nickel, Silver or Phosphor Bronze
American Brass Co., The, Waterbury, Conn.
Phosphor Bronze Smelting Co., The, Phila.
Revere Copper & Brass, Inc., 230 Park Ave., N. Y. C.
Riverside (N. J.) Metal Co.
Seymour (Conn.) Mfg. Co.

SHEETS—Chrome
American Sheet & Tin Plate Co. (U. S. Steel Corp. Subsidiary), Pittsburgh.

SHEETS—Chrome Nickel
American Sheet & Tin Plate Co. (U. S. Steel Corp. Subsidiary), Pittsburgh.

SHEETS—Cold Rolled
American Rolling Mill Co., Middletown, O.
American Sheet & Tin Plate Co. (U. S. Steel Corp. Subsidiary), Pittsburgh.
Continental Steel Corp., Kokomo, Ind.
Empire Sheet & Tin Plate Co., Mansfield, Ohio.
Great Lakes Steel Corp., Detroit.
Inland Steel Co., Chicago.
Republic Steel Corp., Cleveland, Ohio.
Weirton (W. Va.) Steel Co.

SHEETS—Copper Alloy
American Brass Co., The, Waterbury, Conn.
American Radiator Co., 40 W. 40th St., New York City.

SHEETS—Copper Steel
American Sheet & Tin Plate Co. (U. S. Steel Corp. Subsidiary), Pittsburgh.
Newport (Ky.) Rolling Mill Co., The.
Superior Sheet Steel Co., Canton, Ohio.

SHEETS—Electrical
American Rolling Mill Co., Middletown, O.
American Sheet & Tin Plate Co. (U. S. Steel Corp. Subsidiary), Pittsburgh.
Empire Sheet & Tin Plate Co., Mansfield, Ohio.
Newport (Ky.) Rolling Mill Co., The.
Republic Steel Corp., Cleveland, Ohio.

SHEETS — Enameling
American Rolling Mill Co., Middletown, O.
American Sheet & Tin Plate Co. (U. S. Steel Corp. Subsidiary), Pittsburgh.
Columbia Steel Co. (U. S. Steel Corp. Subsidiary), San Francisco, Calif.
Empire Sheet & Tin Plate Co., Mansfield, Ohio.
Great Lakes Steel Corp., Detroit.
Inland Steel Co., Chicago.
Newport (Ky.) Rolling Mill Co., The.
Superior Sheet Steel Co., Canton, Ohio.

SHEETS—For Drawing and Stamping
American Rolling Mill Co., Middletown, O.
American Sheet & Tin Plate Co. (U. S. Steel Corp. Subsidiary), Pittsburgh.
Empire Sheet & Tin Plate Co., Mansfield, Ohio.
Newport (Ky.) Rolling Mill Co., The.
Republic Steel Corp., Cleveland, Ohio.
Ryerson, Jos. T., & Son, Inc., Chicago.
Superior Sheet Steel Co., Canton, Ohio.
Worth Steel Co., Claymont, Del.

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American Sheet & Tin Plate Co. (U. S. Steel Corp. Subsidiary), Pittsburgh.
Bethlehem (Pa.) Steel Company.
Columbia Steel Co. (U. S. Steel Corp. Subsidiary), San Francisco, Calif.
Continental Steel Corp., Kokomo, Ind.
Granite City (Ill.) Steel Co.
Inland Steel Co., Chicago.
Newport (Ky.) Rolling Mill Co., The.
Republic Steel Corp., Cleveland, Ohio.
Ryerson, Jos., T., & Son, Inc., Chicago.
Superior Sheet Steel Co., Canton, Ohio.
Tennessee Coal, Iron & Railroad Co. (U. S. Steel Corp. Subsidiary), Birmingham, Ala.
Weirton (W. Va.) Steel Co.
Youngstown (Ohio) Sheet & Tube Co., The.

SHEETS—Long Terne
American Sheet & Tin Plate Co. (U. S. Steel Corp. Subsidiary), Pittsburgh.
Newport (Ky.) Rolling Mill Co., The.
Superior Sheet Steel Co., Canton, Ohio.
Weirton (W. Va.) Steel Co.

SHEETS—Magnesium Alloys
Dow Chemical Co., 921 Jefferson Ave., Midland, Mich.

SHEETS—Metal Furniture
American Sheet & Tin Plate Co. (U. S. Steel Corp. Subsidiary), Pittsburgh.
Newport (Ky.) Rolling Mill Co., The.
Republic Steel Corp., Cleveland, Ohio.

SHEETS—Pickled
American Sheet & Tin Plate Co. (U. S. Steel Corp. Subsidiary), Pittsburgh.
Empire Sheet & Tin Plate Co., Mansfield, Ohio.
Newport (Ky.) Rolling Mill Co., The.
Superior Sheet Steel Co., Canton, Ohio.

SHEETS—Tin Mill Black
American Rolling Mill Co., Middletown, O.
American Sheet & Tin Plate Co. (U. S. Steel Corp. Subsidiary), Pittsburgh.
Empire Sheet & Tin Plate Co., Mansfield, Ohio.
Newport (Ky.) Rolling Mill Co., The.

SHELVING—Steel
Berger Mfg. Co., The, Canton, Ohio.

SHOES—Horse and Mule
Burden Iron Co., Troy, N. Y.

SHOP FURNITURE
New Britain-Gridley Mch. Co., The, New Britain, Conn.

SHOWER BATH EQUIPMENT
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Great Lakes Foundry Sand Co., Detroit.

SLABS
Andrews Steel Co., The, Newport, Ky.

SLINGS—Wire Rope
Roebling's, John A., Sons Co., Trenton, N. J.

SLITTING MACHINES
Torrington (Conn.) Mfg. Co., The.

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Thomas Spacing Mach. Co., Pittsburgh.

SPECIAL MACHINERY
Baldwin-Southwark Corp., Southwark Div., Philadelphia.
Bullard Co., The, Bridgeport, Conn.
Eastern Tool & Mfg. Co., Bloomfield, N. J.
Love Bros., Inc., Aurora, Ill.
Manville, E. J., Mch. Co., Waterbury, Ct.
Morgan Engineering Co., The, Alliance, O.
Taft-Peirce Mfg. Co., The, Woonsocket, R. I.
Torrington (Conn.) Mfg. Co., The.
Wood, H. D., & Co., Philadelphia.

SPECIALTIES—Rubber Covered & Lined
American Hard Rubber Co., 11 Mercer St., N. Y. C.
Goodrich, B. F., Co., The, Akron, Ohio.

SPEED REDUCERS
Boston Gear Wks., Inc., North Quincy, Mass.
Cleveland (Ohio) Worm & Gear Co.
Foote Gear Wks., Inc., 1315 S. Cicero Ave., Cicero, Ill.
Horsburgh & Scott Co., 5112 Hamilton Ave., Cleveland.
James, D. O., Mfg. Co., Chicago.
Link-Belt Co., Chicago.
Michigan Tool Co., Detroit, Mich.
Morse Chain Co., Ithaca, New York.
Philadelphia (Pa.) Gear Works.

SPIKES—Track
Ames, W., & Co., Jersey City, N. J.
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Weirton (W. Va.) Steel Co.

SPINDLES—Grinding
Ex-Cell-O Aircraft & Tool Corp., 1200 Oakman Blvd., Detroit.

SPINDLES—Hollow Bored
American Hollow Boring Co., 1912 Raspberry St., Erie, Pa.

SPLICE BARS
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.

SPRING MAKING MACHINERY
Baird Mch. Co., The, Bridgeport, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.

SPRINGS—Car
Miller & Van Winkle, Inc., 18 Bridge St., Brooklyn, N. Y.
Muehlhausen Spring Co., Logansport, Ind.

SPRINGS—Extension, Compression, Torsion or Flat
Amer. Spring & Mfg. Corp., Holly, Mich.
American Steel & Wire Co. (U. S. Steel Corp. Subsidiary), Chicago.
Barnes-Gibson-Raymond, Inc., Detroit.
Barnes, Wallace, Co., The, Bristol, Conn.
Cook Spring Co., Div. of Barnes-Gibson-Raymond, Inc., Ann Arbor, Mich.
Cuyahoga Spring Co., The, Cleveland.
Dunbar Bros. Co., Bristol, Conn.
Gibson, Wm. D., Co., Chicago.
Hubbard, M. D., Spring Co., 750 Central Ave., Pontiac, Mich.
Lee Spring Co., Inc., 30 Main St., Brooklyn, N. Y.
Miller & Van Winkle, Inc., 18 Bridge St., Brooklyn, N. Y.
Muehlhausen Spring Co., Logansport, Ind.
Raymond Mfg. Co., Corry, Pa.
U. S. Steel Wire Spring Co., Cleveland, O.
Wickwire Spencer Steel Co., 41 East 42nd St., N. Y. C.

SPROCKETS
Baldwin-Duckworth Chain Corp., Springfield, Mass.
Boston Gear Wks., Inc., North Quincy, Mass.
Diamond Chain & Mfg. Co., Indianapolis, Ind.
Morse Chain Co., Ithaca, New York.
Whitney Chain & Mfg. Co., Hartford, Ct.

STAMPINGS OR DRAWINGS—Metal
Barnes-Gibson-Raymond, Inc., Detroit.
Barnes, Wallace, Co., The, Bristol, Conn.
Berger Mfg. Co., The, Canton, Ohio.
Central Iron & Steel Co., Harrisburg, Pa.
Champion Sheet Metal Co., Inc., cor. Squires & Duane Sts., Cortland, N. Y.
Cook Spring Co. Div. of Barnes-Gibson-Raymond, Inc., Ann Arbor, Mich.
Crosby Co., The, Buffalo, N. Y.
Dunbar Bros., Co., Bristol, Conn.
Eastern Tool & Stpg. Co., Inc., Saugus, Mass
Gibson, Wm. D., Co., Chicago.
Hubbard, M. D., Spring Co., 750 Central Ave., Pontiac, Michigan.
Lansing (Mich.) Stamping So., So. Penn. Ave.
Lee Spring Co., Inc., 30 Main St., Brooklyn, N. Y.
Miller & Van Winkle, Inc., 18 Bridge St., Brooklyn, N. Y.
Parish Pressed Steel Co., Reading, Pa.
Raymond Mfg. Co., Corry, Pa.
Schwartz, Jerome A., 18 W. 27th St., N. Y. C.
Sheet Metal Specialty Co., Pittsburgh, Pa.
Toledo (Ohio) Stamping & Mfg. Co.
Torrington (Ct.) Co.
Transue & Williams, Pressed Steel Div., Alliance, Ohio.
Truscon Steel Co., Pressed Steel Div., Cleveland.
Whitehead Stamping Co., 1669 W. Lafayette Blvd., Detroit, Mich.
Worcester (Mass.) Stamped Metal Co.

STAMPS—Steel Alphabets and Figures
Noble & Westbrook Mfg. Co., The, East Hartford, Ct.

STAPLES—Wire
Continental Steel Corp., Kokomo, Ind.
Wickwire Brothers, Cortland, N. Y.

STEEL—Acid Resisting
Duriron Co., Inc., The, 438 N. Findlay St., Dayton, Ohio.

STEEL—Alloy
Alan Wood Steel Co., Conshohocken, Pa.
Andrews Steel Co., The, Newport, Ky.
Bethlehem (Pa.) Steel Company.
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Harrisburg (Pa.) Steel Corp.
Ingersoll Steel & Disc Co., Chicago.
Latrobe (Pa.) Electric Steel Co.
Ludlum Steel Co., Watervliet, N. Y.
Republic Steel Corp., Cleveland, Ohio.
Ryerson, Jos. T., & Son, Inc., Chicago.
Tennessee Coal, Iron & Railroad Co. (U. S. Steel Corp. Subsidiary), Birmingham, Ala.
Timken Roller Bearing Co., The, Canton, O.
Timken Steel & Tube Co., The, Canton, Ohio.
Vanadium-Alloys Steel Co., Latrobe, Pa.
Wheelock, Lovejoy & Co., Inc., Cambridge, Mass.

STEEL—Alloy, Cold Drawn
Bliss & Laughlin, Inc., Harvey, Ill.
Union Drawn Steel Co., Massillon, Ohio.
Wheelock, Lovejoy & Co., Inc., Cambridge, Mass.
Wyckoff Drawn Steel Co., Pittsburgh, Pa.

STEEL—Bright Finished
Union Drawn Steel Co., Massillon, Ohio.

STEEL—Carbon
Andrews Steel Co., The, Newport, Ky.
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Harrisburg (Pa.) Steel Corp.
Ingersoll Steel & Disc Co., Chicago.
Latrobe (Pa.) Electric Steel Co.

STEEL—Carbon Vanadium
Andrews Steel Co., The, Newport, Ky.
Latrobe (Pa.) Electric Steel Co.

STEEL—Chrome
Andrews Steel Co., The, Newport, Ky.
Latrobe (Pa.) Electric Steel Co.

STEEL—Chrome Manganese
Latrobe (Pa.) Electric Steel Co.

STEEL—Chrome Nickel
Andrews Steel Co., The, Newport, Ky.
Harrisburg (Pa.) Steel Corp.
Latrobe (Pa.) Electric Steel Co.

STEEL—Chrome Nickel Silver
Ingersoll Steel & Disc Co., Chicago.

STEEL—Chrome Vanadium
Andrews Steel Co., The, Newport, Ky.
Harrisburg (Pa.) Steel Corp.
Latrobe (Pa.) Electric Steel Co.

STEEL—Cold Drawn
Bliss & Laughlin, Inc., Harvey, Ill.
Jones & Laughlin Steel Corp., Pittsburgh.
Latrobe (Pa.) Electric Steel Co.
Rathbone, A. B. & J., Palmer, Mass.
Ryerson, Joseph T., & Son, Inc., Chicago.
Union Drawn Steel Co., Massillon, Ohio.
Wyckoff Drawn Steel Co., Pittsburgh, Pa.

STEEL—Cold Rolled Strips
Acme Steel Co., Chicago.
American Steel & Wire Co. (U. S. Steel Corp. Subsidiary), Chicago.
Athenia Steel Co., 135 William St., N. Y.
Griffin Mfg. Co., Erie, Pa.
Latrobe (Pa.) Electric Steel Co.
Republic Steel Corp., Cleveland, Ohio.

Ryerson, Jos. T., & Son, Inc., Chicago.
Scully Steel Products Co. (U. S. Steel Corp. Subsidiary), Chicago.
Stanley Works, The, New Britain, Conn.; Bridgeport, Conn.
Steel & Tubes, Inc., Cleveland.
Superior Steel Corp., Grant Bldg., Ptgh.
Thomas Steel Co., The, Warren, Ohio.
Weirton (W. Va.) Steel Co.
West Leechburg Steel Co., Pittsburgh.
Wetherell Bros. Co., Cambridge, 39, Mass.

STEEL—Cold Rolled Strips, Electric Copper Coated
Thomas Steel Co., The, Warren, Ohio.

STEEL—Cold Rolled Strips, Electro-Galvanized
Thomas Steel Co., The, Warren, Ohio.

STEEL—Cold Rolled Strips, Electro Tin Coated
Thomas Steel Co., The, Warren, Ohio.

STEEL—Cold Rolled Strips, Stainless
Acme Steel Co., Chicago.
Griffin Mfg. Co., Erie, Pa.

STEEL—Corrosion Resisting
Midvale Co., The, Nicetown, Phila., Pa.

STEEL—Crucible
Vanadium-Alloys Steel Co., Latrobe, Pa.

STEEL—Cutlery
Latrobe (Pa.) Electric Steel Co.
Ludlum Steel Co., Watervliet, N. Y.

STEEL—Die
Andrews Steel Co., The, Newport, Ky.
Disston, Henry, & Sons, Inc., Philadelphia.
Finkl, A., & Sons Co., Chicago.
Jessop, Wm., & Sons, Inc., 121 Varick St., N. Y. C.
Latrobe (Pa.) Electric Steel Co.
Ludlum Steel Co., Watervliet, N. Y.
Milne, A., & Co., 745 Washington St., N. Y. C.

STEEL—Drill
Latrobe (Pa.) Electric Steel Co.
Ludlum Steel Co., Watervliet, N. Y.
Milne, A., & Co., 745 Washington St., N. Y. C.

STEEL—Electric
Disston, Henry, & Sons, Inc., Philadelphia.
Latrobe (Pa.) Electric Steel Co.
Ludlum Steel Co., Watervliet, N. Y.
Timken Roller Bearing Co., The, Canton, O.
Timken Steel & Tube Co., The, Canton, O.
Wheelock, Lovejoy & Co., Inc., Cambridge, Mass.

STEEL—High Speed
Bethlehem (Pa.) Steel Company.
Ingersoll Steel & Disc Co., Chicago.
Latrobe (Pa.) Electric Steel Co.
Ludlum Steel Co., Watervliet, N. Y.
Milne, A., & Co., 745 Washington St., N. Y. C.
Vanadium-Alloys Steel Co., Latrobe, Pa.

STEEL—Hot Rolled Strips
Acme Steel Co., Chicago.
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Great Lakes Steel Corp., Detroit.
Inland Steel Co., Chicago.
Laclede Steel Co., St. Louis, Mo.
Latrobe (Pa.) Electric Steel Co.
Republic Steel Corp., Cleveland, Ohio.
Scully Steel Products Co. (U. S. Steel Corp. Subsidiary), Chicago.
Stanley Works, The, New Britain, Conn.; Bridgeport, Conn.
Steel & Tubes, Inc., Cleveland.
Superior Steel Corp., Grant Bldg., Ptgh.
Weirton (W. Va.) Steel Co.
West Leechburg Steel Co., Pittsburgh.

STEEL—Hot Rolled Strips, Electro Zinc Coated
Thomas Steel Co., The, Warren, Ohio.

STEEL—Hot Rolled Strips, Galvanized
Acme Steel Co., Chicago.

STEEL—Magnet
Latrobe (Pa.) Electric Steel Co.

STEEL—Nickel
Andrews Steel Co., The, Newport, Ky.

STEEL—Open Hearth
Andrews Steel Co., The, Newport, Ky.
Pittsburgh (Pa.) Steel Co.
Timken Roller Bearing Co., The, Canton, O.
Timken Steel & Tube Co., The, Canton, O.

STEEL—Rustless
Acme Steel Co., Chicago.
Griffin Mfg. Co., Erie, Pa.
Latrobe (Pa.) Electric Steel Co.
Ludlum Steel Co., Watervliet, N. Y.
Rustless Iron & Steel Corp., Baltimore, Md.

STEEL—Screw
Bliss & Laughlin, Inc., Harvey, Ill.
Timken Roller Bearing Co., The, Canton, O.
Timken Steel & Tube Co., The, Canton, O.
Union Drawn Steel Co., Massillon, Ohio.
Wyckoff Drawn Steel Co., Pittsburgh, Pa.

STEEL—Special Analysis
Andrews Steel Co., The, Newport, Ky.
Harrisburg (Pa.) Steel Corp.
Latrobe (Pa.) Electric Steel Co.
Ludlum Steel Co., Watervliet, N. Y.
Republic Steel Corp., Cleveland, Ohio.
Timken Roller Bearing Co., The, Canton, O.
Timken Steel & Tube Co., The, Canton, O.
West Leechburg Steel Co., Pittsburgh.

STEEL—Spring
Athenia Steel Co., 135 William St., N. Y.
Barnes-Gibson-Raymond, Inc., Detroit.
Barnes, Wallace, Co., The, Bristol, Conn.
Gibson, Wm. D., Co., Chicago.
Great Lakes Steel Corp., Detroit.
Republic Steel Corp., Cleveland, Ohio.
Timken Roller Bearing Co., The, Canton, O.
Timken Steel & Tube Co., The, Canton, O.

STEEL—Stainless
Acme Steel Co., Chicago.
American Rolling Mill Co., Middletown, O.
Bethlehem (Pa.) Steel Company.
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Disston, Henry, & Sons, Inc., Philadelphia.
Latrobe (Pa.) Electric Steel Co.
Ludlum Steel Co., Watervliet, N. Y.
Midvale Co., The, Nicetown, Phila., Pa.
Republic Steel Corp., Cleveland, Ohio.
Ryerson, Jos. T., & Son, Inc., Chicago.
Scully Steel Products Co. (U. S. Steel Corp. Subsidiary), Chicago.
Union Drawn Steel Co., Massillon, Ohio.
Wetherell Bros. Co., Cambridge, 39, Mass.

STEEL—Stainless Clad
Ingersoll Steel & Disc Co., Chicago.

STEEL—Tool
Bethlehem (Pa.) Steel Company.
Disston, Henry, & Sons, Inc., Philadelphia.
Ingersoll Steel & Disc Co., Chicago.
Jessop, Wm., & Sons, Inc., 121 Varick St., N. Y. C.
Latrobe (Pa.) Electric Steel Co.
Ludlum Steel Co., Watervliet, N. Y.
Midvale Co., The, Nicetown, Phila., Pa.
Milne, A., & Co., 745 Washington St., N. Y. C.
Tennessee Coal, Iron & Railroad Co. (U. S. Steel Corp. Subsidiary), Birmingham, Ala.
Vanadium-Alloys Steel Co., Latrobe, Pa.
Wheelock, Lovejoy & Co., Inc., Cambridge, Mass.

STEEL—Tool, Special Shapes
Latrobe (Pa.) Electric Steel Co.

STEEL—Vanadium
Andrews Steel Co., The, Newport, Ky.
Latrobe (Pa.) Electric Steel Co.

STEEL CONSTRUCTION—Welded (Machine Frames, Parts, Etc.)
Danly Machine Specialties, Inc., Chicago.

STEEL PLANTS AND ROLLING MILLS
Perin Engineering Co., Inc., 535 Fifth Ave., N. Y. C.

STEEL ROLLS
United Engineering & Fdry. Co., Ptgh.

STOKERS
Westinghouse Electric & Mfg. Co., Attica, New York.

STOP WATCHES
Stillman, M. J., Co., Inc., Chicago.

STOPS—Crane Limit
Electric Controller & Mfg. Co., The, Cleveland.

STRAIGHTENING MACHINES—Bar & Tube
Aetna-Standard Engineering Co., The, Youngstown, Ohio.
Kane & Roach, Inc., Syracuse, N. Y.
Medart Co., The, St. Louis, Mo.

STRAIGHTENING MACHINES—Wire
Kane & Roach, Inc., Syracuse, N. Y.
Lewis Machine Co., The, Cleveland, Ohio.

STRAPPING—Box
Acme Steel Co., Chicago.

STRUCTURAL IRON AND STEEL WORK
American Bridge Co. (U. S. Steel Corp. Subsidiary), Pittsburgh.
Morgan Engineering Co., The, Alliance, O.

STRUCTURAL STEEL — See Angles, Beams, Channels and Tees

SUB PRESSES
Danly Machine Specialties, Inc., Chicago.

SWAGING MACHINES
Torrington (Ct.) Co.

SWITCHES—Electric
Westinghouse Elec. & Mfg. Co., East Ptgh.

TANK LININGS
Cellcote Co., The, Cleveland.

TANK LININGS—Rubber
American Hard Rubber Co., 11 Mercer St., N. Y. C.
Goodrich, B. F., Co., The, Akron, Ohio.
Goodyear Tire & Rubber Co., Akron, Ohio.
Manhattan Rubber Mfg. Div. of Raybestos-Manhattan, Inc., The, 2 Townsend St., Passaic, N. J.

TANKS—Compressed Air, Gas, Oil and Water
Scaife, Wm. B., & Sons Co., Ptgh.
Westinghouse Air Brake Co., Industrial Div., Pittsburgh.

TANKS—Elevated Wood
Hauser-Stander Tank Co., The, Cincinnati, Ohio.

TANKS—Iron and Steel
American Car & Foundry Co., 30 Church St., N. Y. C.
Scaife, Wm. B., & Sons Co., Ptgh.

TANKS—Lead Lined
Hauser-Stander Tank Co., The, Cincinnati, Ohio.

TANKS—Pickling
American Hard Rubber Co., 11 Mercer St., N. Y. C.
Cleveland (Ohio) Quarries Co., The.
Goodrich, B. F., Co., The, Akron, Ohio.
Goodyear Tire & Rubber Co., Akron, Ohio.
Manhattan Rubber Mfg. Div. of Raybestos-Manhattan, Inc., The, 2 Townsend St., Passaic, N. J.
Nukem Products Corp., 68 Niagara St., Buffalo, N. Y.

TANKS—Rubber Lined
American Hard Rubber Co., 11 Mercer St., N. Y. C.
Goodrich, B. F., Co., The, Akron, Ohio.
Goodyear Tire & Rubber Co., Akron, Ohio.
Manhattan Rubber Mfg. Div. of Raybestos-Manhattan, Inc., The, 2 Townsend St., Passaic, N. J.

TANKS—Welded
National Tube Co. (U. S. Steel Corp. Subsidiary), Pittsburgh.
Scaife, Wm. B., & Sons Co., Pittsburgh.

TANTALUM CARBIDE
Vanadium-Alloys Steel Co., Vascoloy-Ramet Div., North Chicago, Ill.

TAPPING MACHINES
Allen, Chas. G., Co., Barre, Mass.
Baker Bros., Inc., Toledo, Ohio.
Barnes Drill Co., Rockford, Ill.
Ex-Cell-O Aircraft & Tool Corp., 1200 Oakman Blvd., Detroit.
National Automatic Tool Co., Richmond, Ind.

TAPS—Collapsing
Landis Mach. Co., Inc., Waynesboro, Pa.
Murchey Machine & Tool Co., Detroit.
National Acme Co., The, Cleveland.

TAPS AND DIES
Greenfield (Mass.) Tap & Die Corp.
Landis Mch. Co., Inc., Waynesboro, Pa.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Pratt & Whitney Co., Hartford, Conn.

TEES—See Angles, Beams, Channels and Tees

TELEPHONES—Interior
Screw Machine Products Corp., Prov., R. I.

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Weirton (W. Va.) Steel Co.

TESTING MACHINES—Materials
Baldwin-Southwark Corp., Southwark Div., Philadelphia.
Olsen, Tinius, Testing Mch. Co., Phila., Pa.

THERMOMETERS—Recording
Bristol Co., The, Waterbury, Conn.
Brown Instrument Co., The, Philadelphia.
Leeds & Northrup Co., Philadelphia.

THREAD CUTTING TOOLS—See Dies Taps

THREAD ROLLING MACHINES
Manville, E. J., Mch. Co., Waterbury, Ct.
Nilson, A. H., Mach. Co., Bridgeport, Ct.
Waterbury (Ct.) Farrel Fdry. & Mch. Co.

THREADING MACHINES
Eastern Mch. Screw Corp., New Haven, Conn.
Landis Mch. Co., Inc., Waynesboro, Pa.

THREADING MACHINES—Automatic
Landis Mch. Co., Inc., Waynesboro, Pa.

THREADING MACHINES—Bolt
Murchey Machine & Tool Co., Detroit.

TIE PLATES
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Weirton (W. Va.) Steel Co.

TIES—BALE
Continental Steel Corp., Kokomo, Ind.

TIMING INSTRUMENTS
Stillman, M. J., Co., Inc., Chicago.

TIN PLATE
American Sheet & Tin Plate Co. (U. S. Steel Corp. Subsidiary), Pittsburgh.
Granite City (Ill.) Steel Co.
Inland Steel Co., Chicago.
Jones & Laughlin Steel Corp., Pittsburgh.
Republic Steel Corp., Cleveland, Ohio.
Ryerson, Jos. T. & Son, Inc., Chicago.
Weirton (W. Va.) Steel Co.
Youngstown (Ohio) Sheet & Tube Co., The.

TIN PLATE MACHINERY
Aetna-Standard Engineering Co., The, Youngstown, Ohio.
Wean Engineering Co., Inc., The, Warren, Ohio.

TINNING EQUIPMENT—Sheets
Wean Engineering Co., Inc., The, Warren, Ohio.

TONGS—Automatic
Heppenstall Co., Pittsburgh.

TOOL BITS
Carboloy Co., Inc., 2985 E. Jefferson Ave., Detroit.
Illinois Tool Works, Chicago, Ill.
Vanadium-Alloys Steel Co., Vascoloy-Ramet Div., North Chicago, Ill.

TOOL HOLDERS
Armstrong Bros. Tool Co., Chicago.
Williams, J. H., & Co., Buffalo, N. Y.

TOOLS—Lathe
Armstrong Bros. Tool Co., Chicago.
Carboloy Co., Inc., 2985 E. Jefferson Ave., Detroit.
Illinois Tool Works, Chicago, Ill.
Vanadium-Alloys Steel Co., Vascoloy-Ramet Div., North Chicago, Ill.

TOOLS—Metal Cutting
Carboloy Co., Inc., 2985 E. Jefferson Ave., Detroit.
Illinois Tool Works, Chicago, Ill.
Pratt & Whitney Co., Hartford, Conn.
Vanadium-Alloys Steel Co., Vascoloy-Ramet Div., North Chicago, Ill.

TOOLS—Precision
Starrett, L. S., Co., Athol, Mass.
Vanadium-Alloys Steel Co., Vascoloy-Ramet Div., North Chicago, Ill.

TOOLS—Tantalum Carbide
Illinois Tool Works, Chicago, Ill.
Vanadium-Alloys Steel Co., Vascoloy-Ramet Div., North Chicago, Ill.

TOOLS—Tungsten Carbide
Carboloy Co., Inc., 2985 E. Jefferson Ave., Detroit.
Ex-Cell-O Aircraft & Tool Corp., 1200 Oakman Blvd., Detroit.

TORCHES—Brazing, Cutting and Welding
Air Reduction Sales Co., 60 East 42nd St., N. Y. C.
Linde Air Prods. Co., The, 30 East 42nd St., N. Y. C.
Weldit Acetylene Co., Detroit.

TRACTORS AND TRAILERS — See Trucks, Tractors and Trailers—Industrial

TRAILERS—Industrial — See Trucks, Tractors and Trailers—Industrial

TRAMRAILS—Overhead Systems
American Monorail Co., Cleveland.
Cleveland Tramrail Div. of The Cleveland Crane & Engng. Co., Wickliffe, Ohio.

TRAMWAYS—Wire Rope
Leschen, A., & Sons Rope Co., St. Louis, Mo.

TRANSMISSIONS—Hydraulic
American Engineering Co., Philadelphia.
Oilgear Co., The, 1311 W. Bruce St., Milwaukee.
Vickers, Inc., 1420 Oakman Blvd., Detroit, Mich.

TRANSMISSIONS—Variable Speed
Link-Belt Co., Chicago.
Reeves Pulley Co., Columbus, Indiana.

TREADS—Safety
American Pressed Steel Co., Philadelphia.
Central Iron & Steel Co., Harrisburg, Pa.
Hendrick Mfg. Co., Carbondale, Pa.
Norton Co., Worcester, Mass.

TRUCKS—Elevating (Power)
Baker-Raulang Co., 2175 W. 25th St., Cleveland.
Elwell-Parker Electric Co, The, Cleveland.
Yale & Towne Mfg. Co., The, Phila. Div., Phila., Pa.

TRUCKS—Lift (Hand & Foot)
Yale & Towne Mfg. Co., The, Phila. Div., Phila., Pa.

TRUCKS, TRACTORS AND TRAILERS—Industrial
American Car & Foundry Co., 30 Church St., N. Y. C.
Atlas Car & Mfg. Co., The, Cleveland.
Baker-Raulang Co., 2175 W. 25th St., Cleveland.
Elwell-Parker Electric Co., The, Cleveland.
Yale & Towne Mfg. Co., The, Phila. Div., Phila., Pa.

TUBE MILL MACHINERY
Aetna-Standard Engineering Co., The, Youngstown, Ohio.
Torrington (Conn.) Mfg. Co., The.
United Engineering & Fdry. Co., Pgh.

TUBES—Boiler
National Tube Co. (U. S. Steel Corp. Subsidiary), Pittsburgh.
Pittsburgh (Pa.) Steel Co.
Steel & Tubes, Inc., Cleveland.

TUBES—Copper Alloy
American Brass Co., The, Waterbury, Conn.
American Radiator Co., 40 W. 40th St., New York City.

TUBES—High Carbon
Steel & Tubes, Inc., Cleveland.

TUBES—Nickel Silver
American Brass Co., The, Waterbury, Conn.
Revere Copper & Brass, Inc., 230 Park Ave., N. Y. C.

TUBES—Stainless Steel
Cleveland (Ohio) Tool & Supply Co.
National Tube Co. (U. S. Steel Corp. Subsidiary), Pittsburgh.
Steel & Tubes, Inc., Cleveland.

TUBING—Aluminum Seamless
Aluminum Co. of America, Pittsburgh.

TUBING—Hard Rubber
American Hard Rubber Co., 11 Mercer St., N. Y. C.

TUBING—Magnesium Alloys
Dow Chemical Co., 921 Jefferson Ave Midland, Mich.

TUBING—Nichrome
Steel & Tubes, Inc., Cleveland.

TUBING—Open Seam
Steel & Tubes, Inc., Cleveland.

TUBING—Phosphor Bronze
American Brass Co., The, Waterbury, Conn.
Phosphor Bronze Smelting Co., The, Phila.
Revere Copper & Brass, Inc., 230 Park Ave., N. Y. C.

TUBING—Rubber
Goodrich, B. F., Co., The, Akron, Ohio.

TUBING—Seamless Steel
National Tube Co. (U. S. Steel Corp. Subsidiary), Pittsburgh.
Pittsburgh (Pa.) Steel Co.
Ryerson, Jos. T., & Son, Inc., Chicago.
Steel & Tubes, Inc., Cleveland.
Timken Roller Bearing Co., The, Canton, O.
Timken Steel & Tube Co., The, Canton, O.
Youngstown (Ohio) Sheet & Tube Co., The.

TUBING—Square and Rectangular
Steel & Tubes, Inc., Cleveland.

TUBING—Stainless Steel
Cleveland (Ohio) Tool & Supply Co.
Steel & Tubes, Inc., Cleveland.

TUBING—Welded Steel
National Tube Co. (U. S. Steel Corp. Subsidiary), Pittsburgh.
Steel & Tubes, Inc., Cleveland.
Youngstown (Ohio) Sheet & Tube Co., The.

TUBULAR PRODUCTS
National Tube Co. (U. S. Steel Corp. Subsidiary), Pittsburgh.
Steel & Tubes, Inc., Cleveland.

TUMBLING BARRELS—See Barrels—Tumbling

TUNGSTEN CARBIDE
Carboloy Co., Inc., 2985 E. Jefferson Ave., Detroit.

TURBINE-GENERATORS—Steam
General Electric Co., Schenectady, N. Y.
Westinghouse Electric & Mfg. Co., So. Phila. wks., Phila., Pa.

TURBO-COMPRESSORS
Spencer Turbine Co., Hartford, Conn.

TURNTABLES
Amerian Bridge Co. (U. S. Steel Corp. Subsidiary), Pittsburgh.

TURNTABLES—Industrial
Canton Fdry. & Mch. Co., Cleveland.

TWIST DRILLS
Cleveland (Ohio) Twist Drill Co., The.
Greenfield (Mass.) Tap & Die Corp.
Morse Twist Drill & Mch. Co., New Bedford, Mass.

TYPE—Steel
Noble & Westbrook Mfg. Co., The, East Hartford, Ct.

UNIONS
Crane Co., Chicago.

VALVE DISCS
Garlock Packing Co., The, Palmyra, N. Y.

VALVES—Acid Resisting
Duriron Co., Inc., The, 438 N. Findlay St., Dayton, Ohio.

VALVES—Air Blast for Presses
Littell, F. J., Mch. Co., Chicago.

VALVES—Air & Hydraulic Control
Galland-Henning Mfg. Co., Milwaukee.
Hanniffin Mfg. Co., Chicago.
Westinghouse Air Brake Co., Industrial Div., Pittsburgh.

VALVES—Gas, Water and Steam
Crane Co., Chicago.
Jarecki Mfg. Co., Erie, Pa.
Wood, R. D., & Co., Philadelphia.

VALVES—Hydraulic
Baldwin-Southwark Corp., Southwark Div., Philadelphia.
Crane Co., Chicago.
Galland-Henning Mfg. Co., Milwaukee.
Vickers, Inc., 1420 Oakman Blvd., Detroit, Mich.
Wood, R. D., & Co., Philadelphia

VALVES—Pump, Rubber
Garlock Packing Co., The, Palmyra, N. Y.

VARNISH
Larkin Co., Inc., Buffalo, N. Y.
Maas & Waldstein Co., Newark, N. J.

VARNISH—Acid Resisting
Nukem Products Corp., 68 Niagara St., Buffalo, N. Y.

VISES
Jarecki Mfg. Co., Erie, Pa.

WASHROOM FOUNTAINS
Bradley Washfountain Co., Milwaukee, Wis.

WASHERS—Iron or Steel
Central Iron & Steel Co., Harrisburg, Pa.
Shakeproof Lock Washer Co., Chicago, Ill.

WASHERS—Leather
Chicago (Ill.) Rawhide Mfg. Co., The, 1306 Elston Ave.
Excelsior Leather Washer Mfg. Co., Inc., Rockford, Ill.

WASHERS—Lock
American Nut & Bolt Fastener Co., Pittsburgh.
Beall Tool Co., East Alton, Ill.
Butcher & Hart Mfg. Co., Toledo, Ohio.
Eaton Mfg. Co., Massillon, Ohio.
Hobbs Mfg. Co., Worcester, Mass.
National Lock Washer Co., The, Newark, N. J., and Milwaukee, Wis.
Palnut Co., The, 63 Cordier St., Irvington, N. J.
Philadelphia Steel & Wire Corp., Germantown, Philadelphia, Pa.
Positive Lock Washer Co., The, Newark, N. J.
Shakeproof Lock Washer Co., Chicago, Ill.
Spring Washer Industry, 616 Wrigley Bldg., Chicago, Ill.
Washburn Co., The, Worcester, Mass.

WASHERS—Special
Shakeproof Lock Washer Co., Chicago, Ill.

WASHERS—Spring
American Nut & Bolt Fastener Co., Pittsburgh.
Beall Tool Co., East Alton, Ill.
Butcher & Hart Mfg. Co., Toledo, Ohio.
Eaton Mfg. Co., Massillon, Ohio.
Hobbs Mfg. Co., Worcester, Mass.
National Lock Washer Co., The, Newark, N. J., and Milwaukee, Wis.
Philadelphia Steel & Wire Corp., Germantown, Philadelphia, Pa.
Positive Lock Washer Co., The, Newark, N. J.
Spring Washer Industry, 616 Wrigley Bldg., Chicago, Ill.
Washburn Co., The, Worcester, Mass.

WATER COOLERS
Westinghouse Electric & Mfg. Co., Mansfield, Ohio.

WATER SOFTENERS AND PURIFIERS
Scaife, Wm. B., & Sons, Ptgh.

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Federal Machine & Welder Co., Warren, Ohio.
Thomson-Gibb Elec. Welding Co., Lynn, Mass.
Westinghouse Elec. & Mfg. Co., East Ptgh.

WELDING—Thermit
Metal & Thermit Corp., 120 B'way, N. Y. C.

WELDING CONTACTORS
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WELDING CONTACTS—Spot, Flash & Seam
Mallory, P. R. & Co., Inc., Indianapolis, Ind.

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Air Reduction Sales Co., 60 East 42nd St., N. Y. C.
Linde Air Prods. Co., The, 30 East 42nd St., N. Y. C.
Weldit Acetylene Co., Detroit.

WELDING FIXTURES
Harnischfeger Corp., 4401 W. National Ave., Milwaukee.

WELDING MACHINES—Butt
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Swift Electric Welder Co., Detroit.
Thomson-Gibb Elec. Welding Co., Lynn, Mass.

WELDING MACHINES—Electric Arc
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Harnischfeger Corp., 4401 W. National Ave., Milwaukee, Wis.
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Westinghouse Elec. & Mfg. Co., East Ptgh.

WELDING MACHINES — Electric Arc, Second-Hand. (See Clearing House Section)

WELDING MACHINES—Flash
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Swift Electric Welder Co., Detroit.
Thomson-Gibb Elec. Welding Co., Lynn, Mass.

WELDING MACHINES—Press
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Swift Electric Welder Co., Detroit.
Thomson-Gibb Elec. Welding Co., Lynn, Mass.

WELDING MACHINES—Seam
Federal Machine & Welder Co., Warren, Ohio.
Thomson-Gibb Elec. Welding Co., Lynn, Mass.

WELDING MACHINES—Spot
Federal Machine & Welder Co., Warren, Ohio.
Swift Electric Welder Co., Detroit.
Thomson-Gibb Elec. Welding Co., Lynn, Mass.

WHEELS—Rolled Steel
American Car & Foundry Co., 30 Church St., N. Y. C.
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Standard Steel Works Co., Burnham, Pa.

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Aluminum Co. of America, Pittsburgh.

WIRE—Barb
Continental Steel Corp., Kokomo, Ind.
Jones & Laughlin Steel Corp., Pittsburgh.
Pittsburgh (Pa.) Steel Co.

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Revere Copper & Brass, Inc., 230 Park Ave., N. Y. C.
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Page Steel & Wire Co., Monessen, Pa.
Roebling's, John A., Sons Co., Trenton, N. J.
Seneca Wire & Mfg. Co., The, Fostoria, O.
Webb Wire Works, New Brunswick, N. J.
Wickwire Bros., Cortland, N. Y.
Wickwire Spencer Steel Co., 41 East 42nd St., N. Y. C.

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American Steel & Wire Co. (U. S. Steel Corp. Subsidiary), Chicago.
Roebling's, John A., Sons Co., Trenton, N.J.

WIRE—Mattress
Roebling's, John A., Sons Co., Trenton, N.J.

WIRE, Netting
Continental Steel Corp., Kokomo, Ind.
Roebling's, John A., Sons Co., Trenton, N.J.
Wickwire Brothers, Cortland, N. Y.

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Prentiss, Geo. W., & Co., Holyoke, Mass.
Webb Wire Works, New Brunswick, N. J.
Wickwire Spencer Steel Co., 41 East 42nd St., N. Y. C.

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Rustless Iron & Steel Corp., Baltimore, Md.

WIRE—Special, Drawn Shapes
Rathbone, A. B. & J., Palmer, Mass.

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American Steel & Wire Co. (U. S. Steel Corp. Subsidiary), Chicago.
Barnes, Wallace, Co., The, Bristol, Conn.
Columbia Steel Co. (U. S. Steel Corp. Subsidiary), San Francisco, Calif.
Jones & Laughlin Steel Corp., Pittsburgh.
Pittsburgh (Pa.) Steel Co.
Prentiss, Geo. W., & Co., Holyoke, Mass.
Roebling's, John A., Sons Co., Trenton, N.J.
Seneca Wire & Mfg. Co., The, Fostoria, Ohio.

WIRE—Stainless Steel
Page Steel & Wire Co., Monessen, Pa.

WIRE—Steel
Wickwire Brothers, Cortland, N. Y.

WIRE—Welding
Air Reduction Sales Co., 60 East 42nd St., N. Y. C.
American Steel & Wire Co. (U. S. Steel Corp. Subsidiary), Chicago.
Lincoln Electric Co., The, Cleveland.
Maurath, Inc., 7400 Union Ave., Cleveland.
Metal & Thermit Corp., 120 B'way, N. Y. C.
Page Steel & Wire Co., Monessen, Pa.
Pittsburgh (Pa.) Steel Co.
Revere Copper & Brass, Inc., 230 Park Ave., N. Y. C.
Roebling's, John A., Sons Co., Trenton, N.J.
Seneca Wire & Mfg. Co., The, Fostoria, Ohio.
Wickwire Brothers, Cortland, N. Y.
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Wickwire Bros., Cortland, N. Y.
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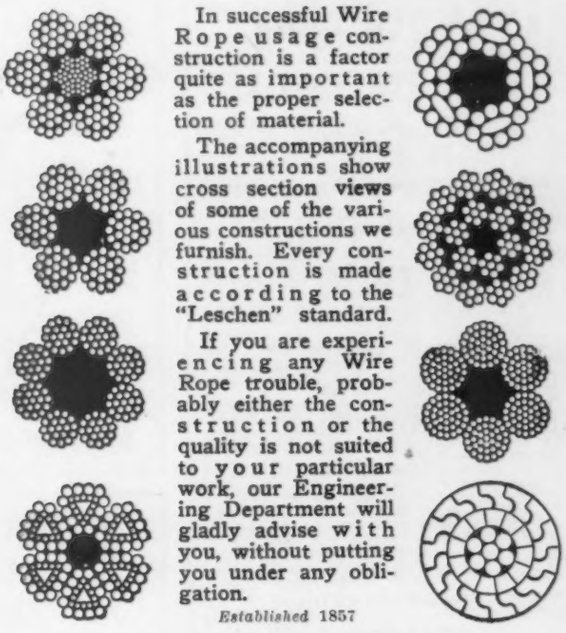
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18"-20½"x10' Reed-Prentice Grd. Hd.
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25"-27"x26' LeBlond Lathe
26"x10' Whitcomb-Blaisdell
27"-30"x16' Lodge & Shipley, Sel. Grd. Hd.
30"-34"x12' Lodge & Shipley, Sel. Grd. Hd.
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36"x18' Lodge & Shipley, Patent Hd.
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5- 6" X 32"	2-10" X 96"
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5-10" X 72"	2-18" X 96"

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10"x36", 10"x52" Landis
12"x36" Landis
20"x120 Landis
20"x168" Landis, M.D.

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No. 1½—10"x30" Landis
No. 2—10"x25" Universal (Bath)
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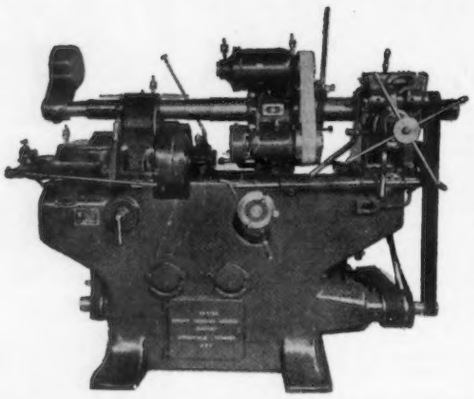
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No. 1½ Landis Internal
No. 2 La Salle Surface
No. 2 Brown & Sharpe Surface
No. 33 Abrasive Vertical Surface
No. 10—16" Blanchard Vertical Surface
No. 16 Blanchard Vertical Surface
No. 3—48" Diamond Surface
15"x17"x72" Norton Open Side Surface
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No 14½ Toledo Horning Press
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⅜	—16	.15	.33
7/16	—14	.15	.39
½	—13	.20	.47
9/16	—12	.25	.56
⅝	—11	.30	.66
11/16	—11	.35	.78
¾	—10	.40	.93
⅞	— 9	.40	1.29
1	— 8	.50	1.73
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4-Spindle Allen High Speed B.B. Drill
6-Spindle Kent Drillers with Motor in Base & equipment
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No. 12 Barber-Coleman Gear Hobber
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2-X Garvin Tapper
No. 2 1" Cap. W & S Cone Type Plain Head Turret Lathe
28" Gisholt Turret Lathe, 6¼" hole in spindle
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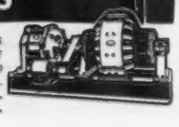
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1—20-Ton Browning Loco Crane					4,000
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Complete with trolleys, excellent condition, weighs 5,000 lbs. **Price $175.00.** Lot of machine tools, cranes, blowers and miscellaneous equipment: must dispose of quickly. Send for list. Not a dealer.

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PAVING BREAKERS
BALTIC MACHINE CO.
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Stillwell 4-2122

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GENERAL MACHINE WORK
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Superior Bronze Corporation
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Capacity 16,000 lbs. per day
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Established 1860

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Every week executives in the metal working industries look through these pages.

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Every week some of them do place orders—some totalling thousands of dollars, not infrequently becoming permanent.

Your opportunities lie here also.

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That is both easy and economical. Let us give you details.

• • • • BUSINESS OPPORTUNITIES • • • •

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J. L. Osgood Machinery & Tool Co.
J. L. Osgood (Proprietor)
Buffalo, N. Y.

Procurement Division, Public Works Branch, Washington, D. C., June 13, 1936.—Sealed proposals in duplicate will be publicly opened in this office at 1 P.M., July 31, 1936, for furnishing all labor and materials and performing all work for the construction of the U.S.P.O. at College Station, Texas. Attention is directed to the special conditions of bidding set forth in the specification. Upon application, one set of drawings and specifications will be supplied free to each general contractor interested in submitting a proposal. The above drawings and specifications MUST be returned to this office. Contractors requiring additional sets may obtain them by purchase from this office at a cost of $5 per set, which will not be returned. Checks offered as payment for drawings and specifications must be made payable to the order of the Treasurer, U.S. Drawings and specifications will not be furnished to contractors who have consistently failed to submit proposals. One set upon request, and when considered in the interests of the Government, will be furnished builders' exchanges, chambers of commerce or other organizations who will guarantee to make them available for any subcontractor or material firm interested, and to quantity surveyors, but this privilege will be withdrawn if the sets are not returned after they have accomplished their purpose. W. E. Reynolds, Assistant Director of Procurement, Public Works Branch.

Procurement Division, Public Works Branch, Washington, D. C., June 4, 1936.—Sealed proposals in duplicate will be publicly opened in this office at 1 P.M., July 3, 1936, for furnishing all labor and materials and performing all work for construction of the U.S.P.O. at Park Ridge, Ill. Attention is directed to the special conditions of bidding set forth in the specification. Upon application, one set of drawings and specifications will be supplied free to each general contractor interested in submitting a proposal. The above drawings and specifications MUST be returned to this office. Contractors requiring additional sets may obtain them by purchase from this office at a cost of $5 per set, which will not be returned. Checks offered as payment for drawings and specifications must be made payable to the order of the Treasurer, U. S. Drawings and specifications will not be furnished to contractors who have consistently failed to submit proposals. One set upon request, and when considered in the interests of the Government, will be furnished builders' exchanges, chambers of commerce or other organizations who will guarantee to make them available for any subcontractor or material firm interested, and to quantity surveyors, but this privilege will be withdrawn if the sets are not returned after they have accomplished their purpose. W. E. Reynolds, Assistant Director of Procurement, Public Works Branch.

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MACHINE SHOP AND FOUNDRY, suitable for heavy work. 150,000 sq. ft. Asking price $150,000. Will divide.

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Specialist in Industrial Properties
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Procurement Division, Public Works Branch, Washington, D. C., June 16, 1936.—Sealed bids in duplicate will be publicly opened in this office at 1 P.M., July 15, 1936, for furnishing all labor and materials and performing all work for construction of the U. S. Insp. Sta. at Scobey, Mont. Drawings and specifications, not exceeding one set, may be obtained from this office in the discretion of the Assistant Director of Procurement, Public Works Branch. W. E. Reynolds, Assistant Director.

Procurement Division, Public Works Branch, Washington, D. C., June 8, 1936.—Sealed proposals in duplicate will be publicly opened in this office at 1 P. M., July 10, 1936, for furnishing all labor and materials and performing all work for construction of the U.S.P.O. at Manchester, Iowa. Attention is directed to the special conditions of bidding set forth in the specification. Upon application, one set of drawings and specifications will be supplied free to each general contractor interested in submitting a proposal. The above drawings and specifications MUST be returned to this office. Contractors requiring additional sets may obtain them by purchase from this office at a cost of $5 per set, which will not be returned. Checks offered as payment for drawings and specifications must be made payable to the order of the Treasurer, U. S. Drawings and specifications will not be furnished to contractors who have consistently failed to submit proposals. One set upon request, and when considered in the interests of the Government, will be furnished builders' exchanges, chambers of commerce or other organizations who will guarantee to make them available for any subcontractor or material firm interested, and to quantity surveyors, but this privilege will be withdrawn if the sets are not returned after they have accomplished their purpose. W. E. Reynolds, Assistant Director of Procurement, Public Works Branch.

Procurement Division, Public Works Branch, Washington, D. C., June 11, 1936.—Sealed proposals in duplicate will be publicly opened in this office at 1 P.M., July 17, 1936, for furnishing all labor and materials and performing all work for construction of the U.S.P.O. at Portales, N. Mex. Attention is directed to the special conditions of bidding set forth in the specification. Upon application, one set of drawings and specifications will be supplied free to each general contractor interested in submitting a proposal. The above drawings and specifications MUST be returned to this office. Contractors requiring additional sets may obtain them by purchase from this office at a cost of $5 per set, which will not be returned. Checks offered as payment for drawings and specifications must be made payable to the order of the Treasurer, U.S. Drawings and specifications will not be furnished to contractors who have consistently failed to submit proposals. One set upon request, and when considered in the interests of the Government, will be furnished builders' exchanges, chambers of commerce or other organizations who will guarantee to make them available for any subcontractor or material firm interested, and to quantity surveyors, but this privilege will be withdrawn if the sets are not returned after they have accomplished their purpose. W. E. Reynolds, Assistant Director of Procurement, Public Works Branch.

The Business Opportunities presented this week do not begin to indicate the full scope of this section . . .

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To secure sales representatives.

To secure new lines to sell.

AND FOR MANY OTHER SIMILAR SERVICES.

Procurement Division, Public Works Branch, Washington, D. C., June 8, 1936.—Sealed proposals in duplicate will be publicly opened in this office at 1 P.M., July 10, 1936, for furnishing all labor and materials and performing all work for construction of the U.S.P.O. at Magnolia, Ark. Attention is directed to the special conditions of bidding set forth in the specification. Upon application one set of drawings and specifications will be supplied free to each general contractor interested in submitting a proposal. The above drawings and specifications MUST be returned to this office. Contractors requiring additional sets may obtain them by purchase from this office at a cost of $5 per set, which will not be returned. Checks offered as payment for drawings and specifications must be made payable to the order of the Treasurer, U.S. Drawings and specifications will not be furnished to contractors who have consistently failed to submit proposals. One set upon request, and when considered in the interests of the Government, will be furnished builders' exchanges, chambers of commerce or other organizations who will guarantee to make them available for any subcontractor or material firm interested, and to quantity surveyors, but this privilege will be withdrawn if the sets are not returned after they have accomplished their purpose. W. E. Reynolds, Assistant Director of Procurement, Public Works Branch.

Procurement Division, Public Works Branch, Washington, D. C., June 15, 1936.—Sealed proposals in duplicate will be publicly opened in this office at 1 P.M., July 16, 1936, for furnishing all labor and materials and performing all work for the construction of the U.S.P.O. at Petersburg, Ill. Attention is directed to the special conditions of bidding set forth in the specification. Upon application, one set of drawings and specifications will be supplied free to each general contractor interested in submitting a proposal. The above drawings and specifications MUST be returned to this office. Contractors requiring additional sets may obtain them by purchase from this office at a cost of $5 per set which will not be returned. Checks offered as payment for drawings and specifications must be made payable to the order of the Treasurer, U.S. Drawings and specifications will not be furnished to contractors who have consistently failed to submit proposals. One set upon request, and when considered in the interests of the Government, will be furnished builders' exchanges, chambers of commerce or other organizations who will guarantee to make them available for any subcontractor or material firm interested, and to quantity surveyors, but this privilege will be withdrawn if the sets are not returned after they have accomplished their purpose. W. E. Reynolds, Assistant Director of Procurement, Public Works Branch.

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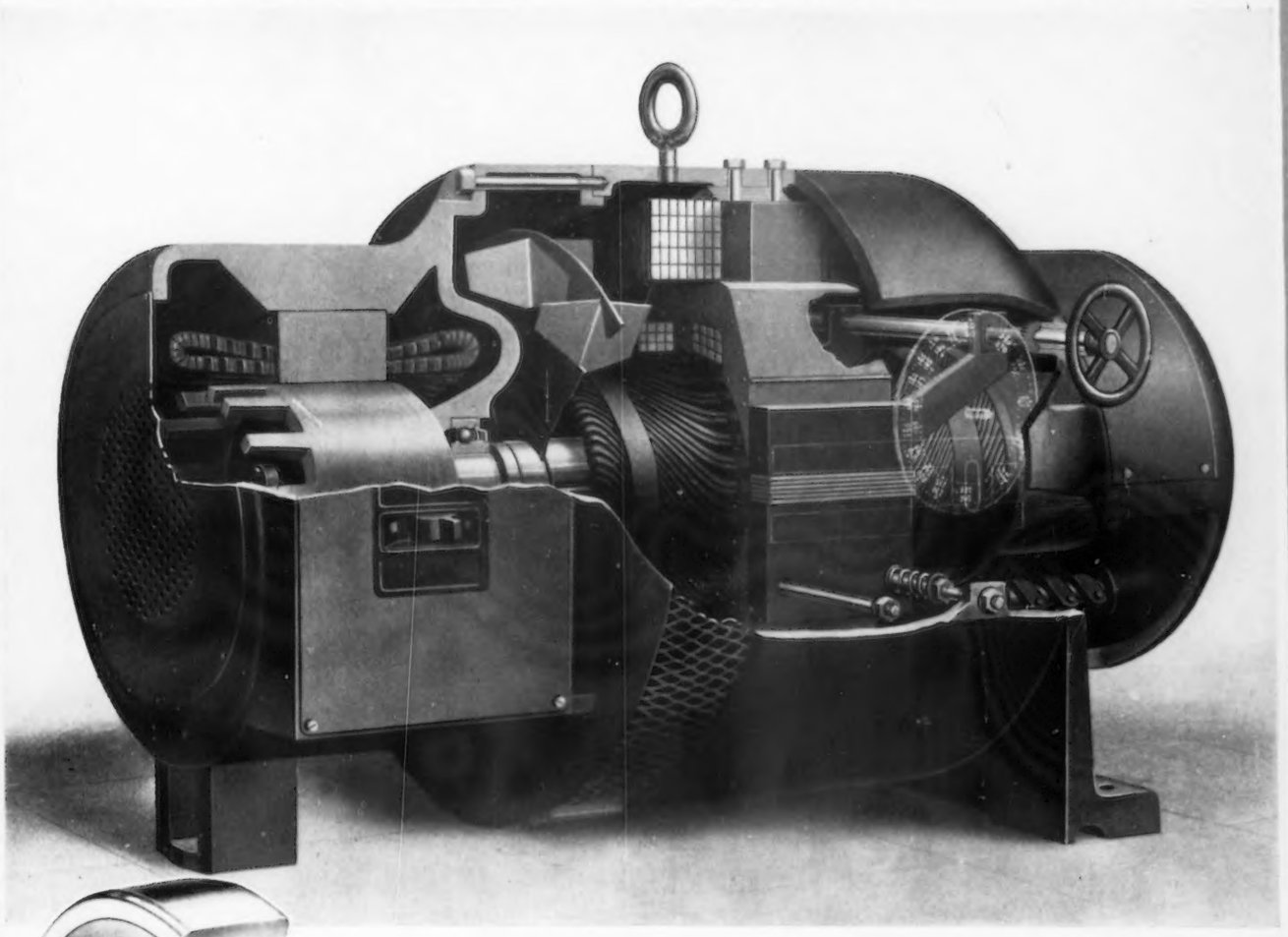
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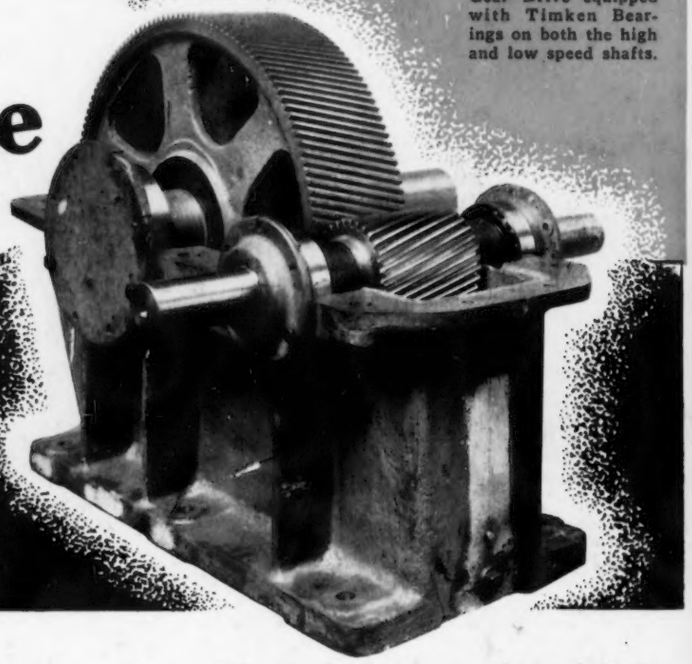
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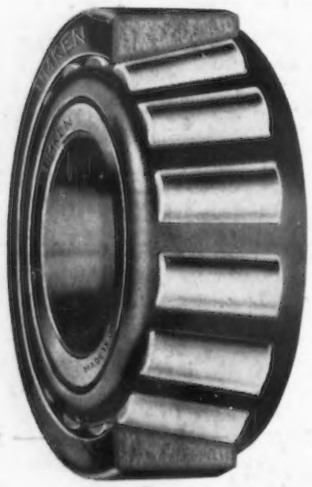
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